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Preformed WIRE ROPE

· THE PUBLISHERS' PAGE ·

A Reader Raises a Question

A FEW WEEKS AGO this page quoted with approval some remarks by the chairman of the National Association of Manufacturers in behalf of "increasing the earning capacities of those in employment and of increasing their number" and of "increasing production while maintaining the lowest competitive price levels." This writer thought that pretty good American doctrine and said so.

Now comes a consulting engineer reader, who writes: "With all due respect to the excellence of *Engineering News-Record* when it confines its observations to engineering matters, let me urge you as a friend, for God's sake to lay off discussion of matters pertaining to economics, social welfare and the like; because your views are as basically unsound and Fascistic as anything coming out of Italy and Germany today. Am I Communistic? No, of course not. I am one hundred per cent for the American system."

His letter continues in the same tenor, but in this extract he raises a very interesting question.

SHOULD A JOURNAL like *Engineering News-Record* really fight shy of matters other than the strictly scientific and technical? Certainly its publishers and editors would find it much easier going to side-step the controversial issues of social and economic progress, and there is strong temptation to conform cheerfully to the views of those readers who, like this one, warn us to lay off.

But it is noteworthy that such counsel comes almost invariably from readers who object to the views or conclusions here expressed. And this holds true of spokesmen on either side of every question. Whenever our views displease, they are prone to advise, more or less vehemently, that we stick to our technical knitting; but when we say the "right thing", our comment is countenanced and applauded. All this might indicate that such critics are more anxious to silence opinions with which they disagree than to preserve the technical sanctity of the paper and the peace of mind of its publishers. Such friendly counsel really will be convincing when someone reverses Voltaire and writes to say, "I agree one hundred per cent with what you say but I don't think it is appropriate for you to say it."

Moreover, as against one such protest, we must record scores of readers who approve emphatically our discussion of economic and social subjects. This does not imply that they always agree with our views. Many express decided difference of opinion or judgment. But it does indicate that they recognize the propriety and desirability of such discussion. And, despite the greater ease of side-stepping such issues, this writer is inclined to concur in their attitude. The current evolution of economic, social and governmental relationships has many phases of peculiar interest and concern to technical men and technical industry. They want to have those phases considered and discussed somewhere, and for that they look naturally to their professional and industrial journals. If these journals, taking counsel only of their own ease and interest, evade the responsibility thus enjoined upon them, they are "letting down" their readers just as truly as though they neglected to serve some part of their technical fields.

NEITHER THIS PAGE nor this journal claims any inspired source of wisdom in its discussion of these contentious matters; both seek only to offer their best reason and judgment. And unless it can be shown that our readers are unable or unwilling to take such discussion in the temperate and reasonable spirit in which it is offered, we shall continue, as heretofore, to discuss such matters to the best of our ability.

Another point made by this correspondent is of immediate concern only to this writer, although because of its bearing on the foregoing, it should be considered. In his letter he says, "either you are dumb as hell, or you are Fascistic in your beliefs." This writer to the best of his knowledge, is not Fascistic, so it follows that he probably *is* "dumb as hell." To have that much removed from the arena of controversy doubtless will help other readers to appraise more accurately the value of the contribution offered each week on this page.

Willard Chevalier

ENGINEERING NEWS-RECORD

Published every Thursday. Vol. 119. No. 8. Price 25c per copy. Subscription, domestic, Canada, Mexico, Central and South American countries, $5 per year. All other countries, $9 a year or 36 shillings. Entered as second-class matter October 29, 1936, at the Post Office at Albany, N. Y., under the act of March 3, 1879. Printed in U. S. A. Cable address "McGrawhill New York." Member A.B.P. Member A.B.C.

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Editorial and Executive Offices: 330 West 42d St., New York. Publication Office: 99-129 N. Broadway, Albany, N. Y. Branch Offices: 520 N. Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, London, W. C. 2, England; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

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YOU ALWAYS HAVE TO MOVE MATERIAL

JEFFREY

. . . your First Source of MATERIAL HANDLING and METHODS

It is a rare engineering job which does not include the moving of quantities of material . . . earth, concrete, sand, aggregate, rock, sludge, garbage. Often material movement is a major part of the job, and yardage looms large in the estimate.

Jeffrey is skilled in the application of material handling to *engineering jobs* . . . has the men who know what it takes . . . the machinery to do it at low cost with maximum efficiency.

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EQUIPMENT

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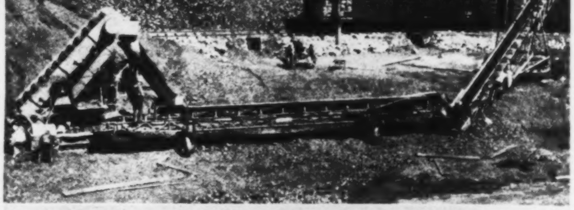
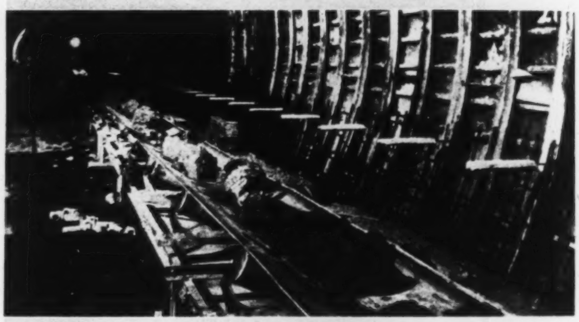
Jeffrey Reliance self-aligning Belt Idlers are standard idlers mounted to swivel at the center. They need only be spaced about 20 to 50 feet apart to keep the belt in perfect alignment. Catalog No. 610-A covers Jeffrey belt conveyors and idlers.



Conveyors "by the rod"—Jeffrey portable outfits can be set up to do a multitude of jobs in engineering and construction. This set-up is handling coal but is applicable to handling sand, gravel, spoil, etc.



Jeffrey 30-inch wide Belt Conveyor used in construction of the traffic tunnel under the Boston harbor. Conveyor is continuous from shield face through automatic air locks to street level, and was a contributing factor in completing tunnel far ahead of schedule.

Conveyors "by the mile" . . . Jeffrey designs and builds conveyors in any lengths, to handle any material which needs moving from one place to another. Also scraper and portable conveyors, feeders, loaders and unloaders, crushers and pulverizers, screens, etc.

·ENGINEERING NEWS-RECORD·

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VOL. 119 *AUGUST 19, 1937* No. 8

THIS WEEK AND NEXT

Picturesque, bold and costly is the great irrigation and regional enterprise that is just getting under way in the Central Valley of California. Economic justification for the work is not wanting and, since economics is the springboard which gives impetus to the engineering and construction, an article on the fundamentals of the project occupies the lead position in this issue.

Economics on a smaller scale but just as vital to engineering development are discussed by H. F. Thomson in an article on merchandising designed concrete, wherein the problems of ready-mixed concrete service are laid bare.

Using ready-mixed concrete and a multitude of other materials, Evansville, Ind., has transformed its riverfront into a municipal park and parkway. The features of this project are presented by L. A. Guepel, city engineer.

A municipal problem of another sort confronted Denver, namely forecasting its water supply from the Rocky Mountain snows. Progressive photographs of the mountain watersheds have greatly aided the forecasters.

Where are the important modern highway lighting installations and what varied design practices do they include? An article in this issue gives the first published answer.

National importance attaches to the new building code of New York City because the old code has long been a model. A critical analysis of the regulations that will go into effect next January is presented by George E. Strehan, long identified with New York building work.

In his third article on waterworks management, Mr. Plowman discusses personnel, purchasing and customers.

Next Week—Lining the Lincoln Tunnel.

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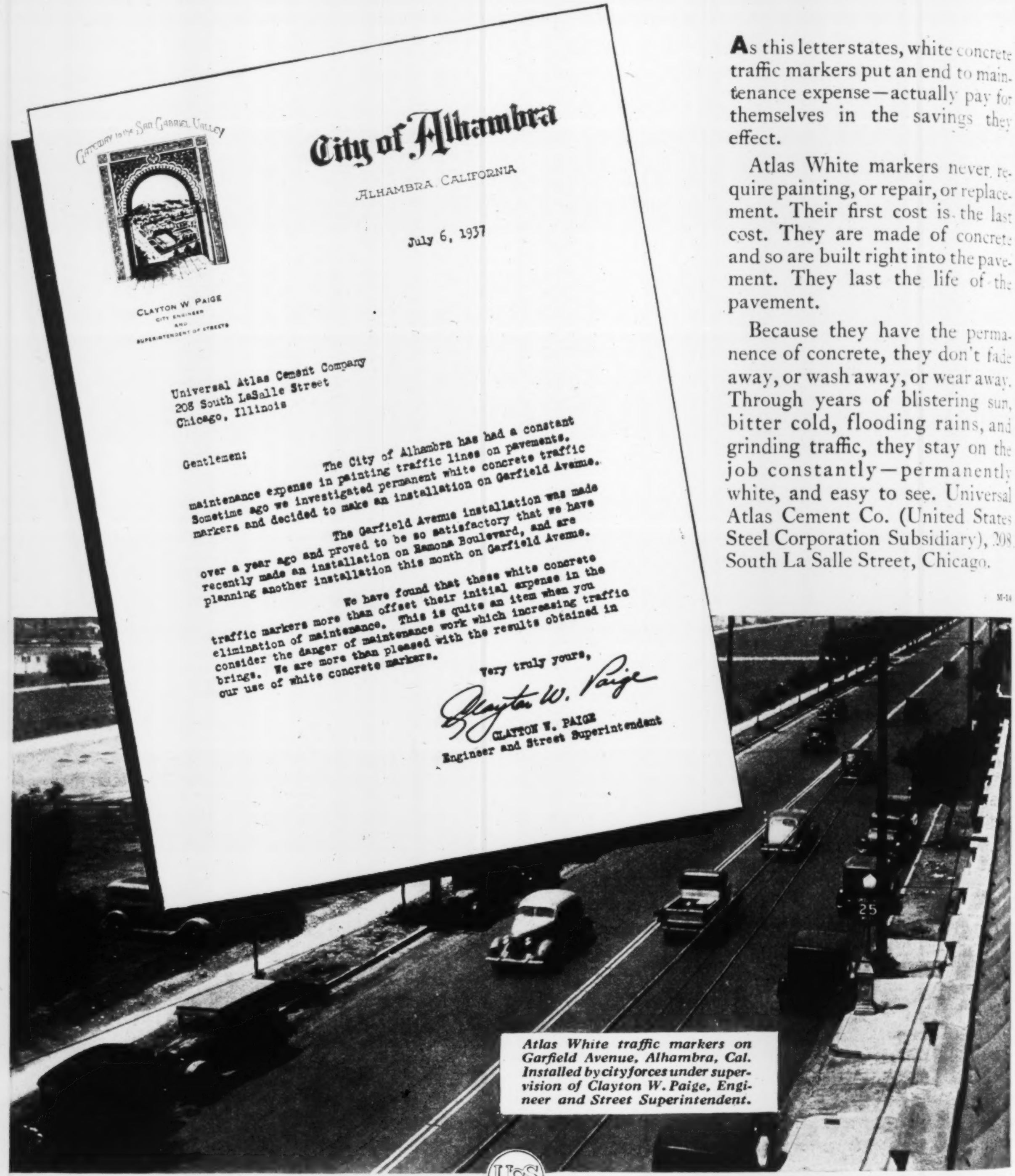
THE COVER PICTURE shows the waterfront at Evansville, Ind., reclaimed from a mudflat for boulevard, boat landing and park

More concrete Evidence that

PERMANENT MARKERS PAY FOR THEMSELVES



Gateway to the San Gabriel Valley

City of Alhambra

Alhambra, California

Clayton W Paige
City Engineer
and
Superintendent of Streets

July 6, 1937

Universal Atlas Cement Company
208 South LaSalle Street
Chicago, Illinois

Gentlemen:

The City of Alhambra has had a constant maintenance expense in painting traffic lines on pavements. Sometime ago we investigated permanent white concrete traffic markers and decided to make an installation on Garfield Avenue.

The Garfield Avenue installation was made over a year ago and proved to be so satisfactory that we have recently made an installation on Ramona Boulevard, and are planning another installation this month on Garfield Avenue.

We have found that these white concrete traffic markers more than offset their initial expense in the elimination of maintenance. This is quite an item when you consider the danger of maintenance work which increasing traffic brings. We are more than pleased with the results obtained in our use of white concrete markers.

Very truly yours,

Clayton W. Paige

CLAYTON W. PAIGE
Engineer and Street Superintendent

Atlas White traffic markers on Garfield Avenue, Alhambra, Cal. Installed by city forces under supervision of Clayton W. Paige, Engineer and Street Superintendent.

As this letter states, white concrete traffic markers put an end to maintenance expense—actually pay for themselves in the savings they effect.

Atlas White markers never require painting, or repair, or replacement. Their first cost is the last cost. They are made of concrete and so are built right into the pavement. They last the life of the pavement.

Because they have the permanence of concrete, they don't fade away, or wash away, or wear away. Through years of blistering sun, bitter cold, flooding rains, and grinding traffic, they stay on the job constantly—permanently white, and easy to see. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), 208 South La Salle Street, Chicago.

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ATLAS WHITE PORTLAND CEMENT

FOR TRAFFIC MARKERS

· ENGINEERING NEWS-RECORD ·
AUGUST 19, 1937

THE WEEK'S EVENTS

Bonneville Power Bill Awaits Signature

Army generates and administrator sells power with costs allocated by FPC

Congressional action was completed Aug. 12 on the bill setting up a temporary administration for the Bonneville hydro-electric and navigation development on the Columbia River in Oregon and Washington when both Senate and House approved the conference report. The bill now goes to the President for approval.

As finally enacted, the bill contains the following provisions:

The Bonneville plant shall be completed, maintained, and operated by the Secretary of War under the supervision of the Chief of Engineers.

Surplus power shall be delivered to an administrator, to be appointed by the Secretary of the Interior and to be paid $10,000. The Administrator will market this energy. To do so he is empowered to build, buy or condemn the necessary real and personal property, including transmission lines, substations, and other electrical facilities; to operate them; and to interconnect with other generating systems.

Operation of the generating station by the War Department shall be in accordance with the requirements of the administrator, and new units shall be installed by the Secretary of War when, in the administrator's judgment, additional capacity is needed to meet actual or potential demands for power.

The administrator will act in consultation with an advisory board composed of representatives of the War, Interior and Agriculture Departments and of the Federal Power Commission (one member from each).

Publicly-owned and co-operative distribution systems shall have preference in the purchase of power. To effectuate this provision 50 per cent of the available energy shall be reserved for their use until January 1, 1941; thereafter any competing applications from public and private distributors shall be resolved in favor of the former, and contracts with private utilities shall be cancellable, in whole or in part, on five years' notice should the power be needed by public distributors.

Contracts shall run for a period of not more than 20 years, with provision for rate revision at intervals of not more than 5 years. Contracts with private parties for direct consumption shall contain a prohibition against re-sale to the general public, either direct or through an intermediary. Contracts with private or public distributors shall stipulate retail rates.

(7) Rate schedules shall be prepared by the administrator and become effective when approved by the Federal

(*Continued on page 290*)

• • •

Ohio Flood Projects Approved by Senate

The Senate Aug 13 passed and sent to conference a bill amending the flood control act of 1936 by adding to the list of authorized projects several additional undertakings in the Ohio Valley. These are not specified, but are to be selected by the Chief of Engineers from those listed in his comprehensive flood control plan for the Ohio River submitted to Congress last May.

The bill also directs preliminary examinations of a number of other flood control proposals within and without the Ohio Valley. As passed by the Senate, it also contains a proviso permitting the President, after investigation, to waive requirements for local participation, in specific cases, either in whole or in part, if a municipality is unable by reason of its financial condition to comply.

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Cost Limit Raised On Housing

House committee has raised Senate limit on construction costs but reduced total amount

A low-cost housing bill raising the Senate limitation on construction costs to $5,000 per family unit and decreasing the total amount of housing authorized to $500,000,000 was favorably reported to the House Aug. 16 by the Banking and Currency Committee.

The committee bill requires that not more than 10 per cent of the total funds provided be expended in any one state, as compared with the 20 per cent restriction embodied in the bill passed by the Senate. It is further required that local communities contribute 15 per cent of the cost of land acquisition for housing projects and also contribute 25 per cent of the rent-reducing subsidies.

The committee bill also contains provision for outright federal grants of not more than 25 per cent of the construction cost plus an additional con-

(*Continued on page 293*)

• • •

River and Harbor Bill Goes to President

By accepting the conference report on the Rivers and Harbors bill of 1937, the House, Aug. 12, completed Congressional action on the measure, which now awaits the President's signature. In its final form the bill authorizes the appropriation of $53,701,525 for 146 navigation improvement projects in all parts of the country and directs the Chief of Engineers to make preliminary examinations of a large number of other proposed improvements. The bill makes no actual appropriations; money to cover the projects must be provided in subsequent War Department appropriation bills.

The conference committee accepted 16 new projects added to the bill because favorable reports were received from the Chief of Engineers after the House had completed the preparation of the original draft. An additional project at Clearwater Harbor, Fla., which lacked such approval, was rejected.

Army Flood Study Thrown Out

President vetoes measure as making army sole planning body for nation

On the ground that it would make the war department "the national planning agency, not alone for flood control, but for all the other multiple uses of water," the President, Aug. 13, vetoed a joint Congressional resolution directing the war department to make a comprehensive survey of flood control on all river basins in the country (*ENR*, Aug. 5, 1937, p. 205). At the same time the President stated that such a comprehensive plan could be developed without legislative action, and that he proposed to submit such a plan, prepared by all of the government agencies concerned, to the Congress in January.

The President's veto message follows in part:

"In my message of June 3, 1937, I proposed for the consideration of Congress a thoroughly democratic process of national planning of the conservation and utilization of the water and related land resources of our country. I expressed the belief that such a process of national planning should start at the bottom through the initiation of planning work in the state and local units, and that it should contemplate the formulation of programs on a regional basis, and the integration of fiscal and conservation policies on a national basis, and the submission of a comprehensive development program to the Congress by the President.

"The reverse of such a process . . . is prescribed in [the resolution]. By this resolution the war department would become the national planning agency, not alone for flood control, but for all the other multiple uses of water . . . The local and regional basis of planning would be ignored, and there would be no review of the whole program prior to its presentation to Congress from the standpoints of national budgetary considerations and national conservation policies.

". . . [The Engineer Corps'] experience and background are not alone sufficient, however, for the planning of a comprehensive program for the development of the vast water and related resources of a nation.

"The planning of the use and control of water and related resources is distributed by law among numerous governmental agencies . . . The joint resolution encroaches upon the functions of these agencies and ignores and duplicates the coordinated planning work already in progress under the general guidance of the national resources committee.

"This does not mean, however, that the objective of this joint resolution cannot be attained without the need of any legislation whatsoever. I propose to present to the Congress in January a comprehensive national plan for flood control and prevention and the development of water and soil conservation, such a plan to be prepared by all of the many governmental agencies concerned."

• • •

Wide World

LIGHTNING DESTROYS EDISON MEMORIAL

LIGHTNING struck the Edison Memorial Tower, under construction at Menlo Park, N. J., destroying the temporary steel tower and the scaffolding for the mosaic-concrete tower which was to encase the temporary structure.

The steel frame work of the tower was erected in 1929 on the site of the work bench on which Edison first invented the incandescent bulb. It was to be encased in a permanent concrete structure, the foundation for which was dedicated last July 1. The scaffolding for the new structure had been completed (*ENR*, Aug. 12, 1937, p. 275).

A model incandescent bulb, set in a glass case at the base of the tower and supplied with current from 4 independent sources so that it would never be extinguished was buried under 4 ft. of debris, and its glass case was broken, but the memorial light was not put out.

Army-Navy Works Bills Approved by Senate

Construction programs at a number of army and navy posts were authorized by the Senate Aug. 13 in two bills providing for the needs of the two services. The army list totals $25,587,000, of which the two largest items are $2,880,000 for the improvement and rehabilitation of the Air Corps Technical School at Chanute Field, Ill., and $2,275,000 for the construction of a branch of that unit near Denver, Colo. The bill has been passed by the House.

The naval program is much smaller, totalling only $6,099,057. This bill has not yet been considered by the House.

Pennsylvania Works Plan Gets Under Way

Approval of twelve PWA jobs in Pennsylvania for construction by the General State Authority marks the beginning of Pennsylvania's $65,000,000 public works program. The twelve projects call for cash grants totalling $1,633,000 and loans of $8,994,000. However, there will be deducted from the amount of the loan 133 1/3 per cent of the wages paid to relief labor on the projects.

The projects approved include construction of the Laurelton State Village, additions to the state teachers' college at Shippensburg, construction of state militia buildings, additions to the state hospital for crippled children at Elizabethtown, and additions to six state hospitals and reformatories.

The Pennsylvania public works program, which is under the direction of the Pennsylvania General State Authority, is being financed by an outright grant of $10,000,000 to the State Authority by PWA and loans of $55,000,000. However, 133 1/3 per cent of wages for relief labor will be deducted from the loan and credited as a grant, up to an established maximum amount of $10,000,000.

THE CURRENT TREND

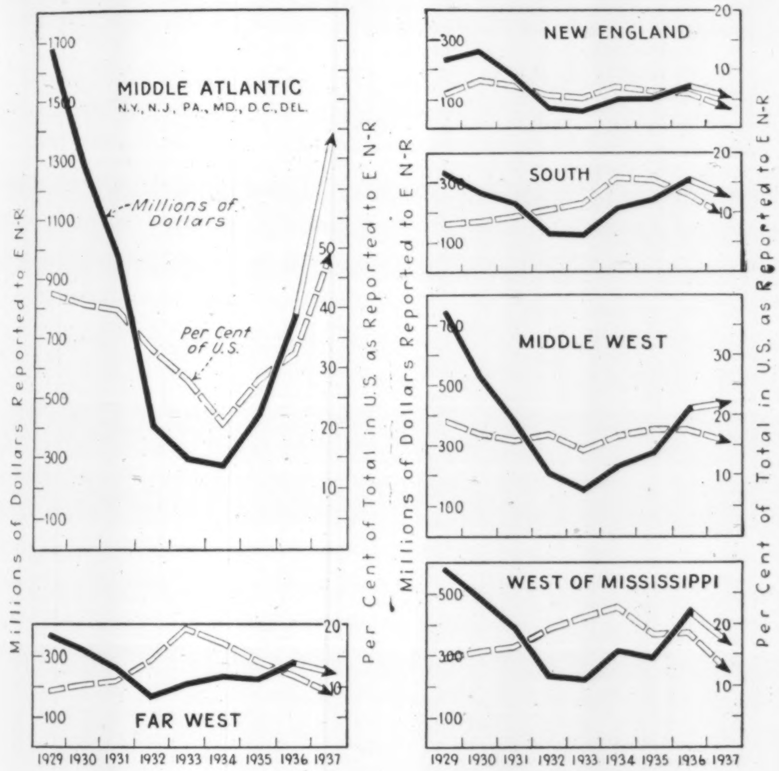
This week's news of contract volume and construction cost factors

Industrial States Lead

Back to construction work movement flourishes in Middle Atlantic and Middle West states.

With the rise in private construction the volume charts for the industrial states take the spotlight. The Middle Atlantic group, lead by New York, Pennsylvania, New Jersey makes the most spectacular showing due largely to industrial building and to housing construction. Middle West states, Ohio, Illinois, Indiana, Wisconsin, Michigan also show a small gain over last year.

The volume recorded for Southern states shows a drop compared with previous year which can be accounted for by the lack of TVA major commitments for new work. The current rate for Southern construction is at predepression levels. New England activity is leveling off this year at about 60 per cent of predepression volume. Far West, comprising the Pacific Coast states, is dropping below last year as are also the states west of the Mississippi and east of the Rockies.



Concrete Pavement Yardage

Concrete pavement yardage for roads, which has been running well ahead of 1936, dropped in July 43 per cent below the 1936 July volume. Street yardage dropped 5 per cent, while alleys gained 26 per cent. A net gain of 13 per cent for all three classes for the 7 months period is reported by the Portland Cement Association.

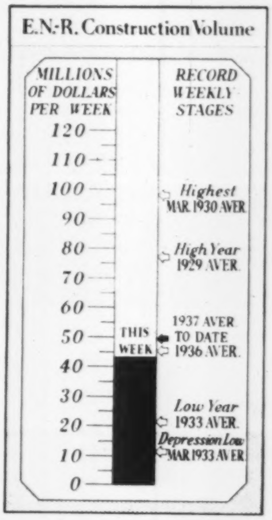
	Square Yards Awarded		
	July, '37	7 mo., '37	7 mo., '36
Roads ..	3,561,956	23,928,564	19,730,409
Streets ..	1,575,932	7,641,190	8,213,002
Alleys ..	48,613	279,005	207,923
Total ..	5,186,501	31,848,759	28,151,334

• • •

New York Permits Decline

For the second consecutive month building permits reported for 215 cities by Dun and Bradstreet dropped below the corresponding month last year. July permits, totalling $91,282,414, compare with $95,281,845 a year ago, and with $94,616,271 in June. This June to July decrease of 3.5 per cent compares with a usual seasonal decline for this period of 10.5 per cent. New York City permits declined 20.8 per cent while the 214 cities outside New York gained 0.4 per cent. For the seven months, compared with last year New York City gained 16.7 per cent, 214 cities 22.6 per cent. The largest gains for the 7 months to date this year are in Boston, 150.9; Chicago, 70.7; Portland, Ore., 65.9; Philadelphia, 55.9; Milwaukee, 55.8; Detroit, 52.6 per cent.

E.N.-R. Construction Volume



ENR INDEX VALUES

Index	Base 1913	1926
Construction Cost (Aug.) ..	242.95	116.78
Construction Volume (July)	185	81

THIS WEEK'S FIGURES

(Thousands of Dollars)

CONTRACTS

	Week Ending		
	Aug. 20 1936	Aug. 12 1937	Aug. 19 1937
Federal	$16,720	$7,288	$2,247
State & Municipal	27,831	23,888	21,432
Total public ..	$44,551	$31,176	$23,679
Total private.	5,521	14,172	19,662
TOTALS	$50,072	$45,348	$43,341

Cumulative
1937 (33 weeks)................$1,638,159
1936 (34 weeks)................$1,492,577

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative	
	1936, 34 Wks.	1937, 33 Wks.
NON-FEDERAL	$548,275	$992,102
State & mun. bonds..	326,456	359,801
Corporate securities...	151,716	390,327
PWA loans and grants	59,289	12,035
RFC loans	10,814	29,939
Fed. aid for highways	......	200,000
FEDERAL	$691,237	$261,057
TOTAL CAPITAL	$1,239,512	$1,253,159

WPA Spent $400,000,000 In New York City

Eighty per cent of expenditures were for physical improvements and maintenance

From the inception of its program Aug. 1, 1935, to July 1 of this year, the WPA has spent $409,195,000 in New York City on work relief projects sponsored by the city, the state, and the federal government, it was reported in a letter from Col. Brehon Somervell, New York City WPA Administrator, to National Administrator Harry L. Hopkins. On projects sponsored by the city, WPA spent $385,831,000.

Of the amount expended on city-sponsored projects, 81.8 per cent, or $315,724,000, was used for physical improvements, while 18.2 per cent went for personal services. Colonel Somervell's report classifies the physical improvement projects into repairs and into construction involving future maintenance. The amount spent for repairs was $169,906,000 and the amount for new construction was $145,818,000.

Another $14,111,000 was expended on state-sponsored projects, of which $11,743,000 was for physical improvements, divided into $1,528,000 for repairs and $10,216,000 for new work. Projects sponsored by federal agencies received $9,252,000.

Parks received most

The largest expenditure of WPA funds in New York City for any one department was for the development of the park system. The Park Department has sponsored projects on which WPA has expended $113,497,000. Work done has included increasing the 164 parks and playgrounds which were in the city before WPA went into operation to 313. To the two public swimming pools previously existing, ten have been added. Several large parks have been completely rehabilitated by WPA work.

Of the funds used for the Department of Parks, $1,357,000 was for personal service and $112,140,000 for permanent improvements.

WPA spent $44,792,000 on projects sponsored by the Board of Education, of which $17,265,000 was for the improvement of school property. Most of this work was for repairs, and only $4,114,000 went into construction work involving future maintenance. Repair work was done on more than 300 buildings; most of the new construction involved building or rebuilding school playgrounds.

Projects sponsored by the boroughs, mostly for permanent improvements to highways, sewers and public buildings, amounted to $110,717,000. All but $1,373,000 of this was for repairs and new construction, with repairs taking $96,531,000.

Permanent improvements for the boroughs included the paving or repairing of 433 miles of highways and the removal of 67 miles of abandoned car tracks, the construction of 66 miles of storm and sanitary sewers, and erection of 58 new buildings.

The Department of Hospitals sponsored projects on which WPA expended $16,876,000, of which about half was for personal services and half for repairs. The Department of Health received $8,936,000 for mosquito control.

Water consumption reduced

The WPA spent $10,003,000 on projects for the Department of Water Supply, Gas and Electricity, of which $8,544,000 was for improvements.

An important item in the work done for the water department consisted of a number of leakage surveys, which resulted in savings of 44 million gallons per day, $5,969,000 was spent for repairs to water mains, of which $3,000,000,000 involved new construction. About 12 miles of new pipe has been laid.

The Department of Plant & Structures received $7,289,000, a large part of which was expended on repairs to bridge roadways, repairs to bridge structure and to buildings of the department, and repairs to municipal ferry terminals.

Tenement demolition

W.P.A. expenditures for the tenement house department totaled $5,040,000, of which $1,759,000 was for a slum survey and $3,281,000 was for demolition of old tenements and repair of others. In this work 1,121 old-law tenements were demolished, about 36 acres was cleared, and about 26 acres of the area left vacant was graded.

Repairs and alterations to armories amounted to $3,405,000, for structures of the department of markets, $2,840,000, and for repairs and alterations to library buildings, $2,168,000. $2,992,000 was spent on fire department jobs of which $1,410,000 was for new work, chiefly consisting of undergrounding the fire alarm system.

The W.P.A. spent $2,303,000 for repairs and construction for the department of sanitation, consisting chiefly of repairs to existing buildings and the building of a series of sixteen new section houses, and preparation of designs for an incinerator. Repair work on city prisons amounted to $1,124,000, and new construction to $271,000.

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Slum and Pollution Bills Signed in Pennsylvania

Governor Earle of Pennsylvania has signed two bills passed by the last session of the Pennsylvania Legislature. One of them provides for the setting up of local housing authorities (*ENR*, June 24, 1937, p. 928) which would have power to acquire land by process of eminent domain and to issue revenue bonds for housing projects.

The LaRue stream pollution bill (*ENR*, July 8, 1937, p. 47) was also signed by the governor. This bill empowers the state Sanitary Water Board to prohibit any pollution of waters in the state by sanitary or industrial waste and sets up severe penalty for noncompliance.

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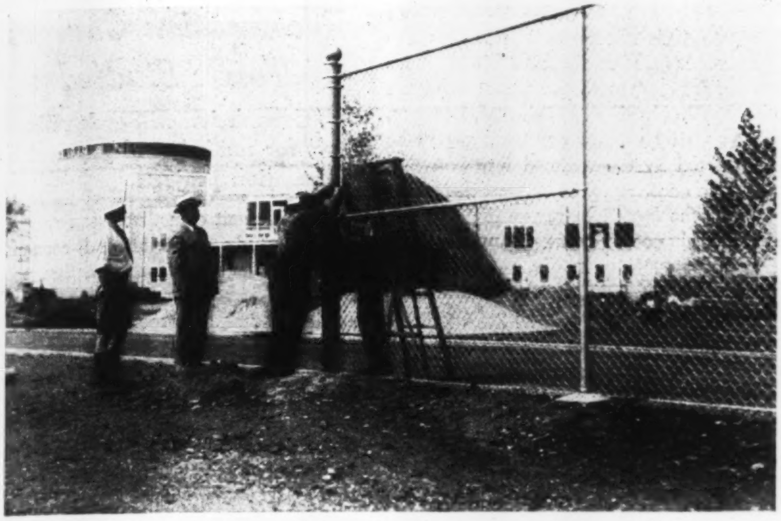
Bonneville Bill Passed

(*Continued from page 287*)

Power Commission. They shall be fixed "with a view to encouraging the widest diversified use of electricity". Schedules "may provide for uniform rates or rates uniform throughout prescribed transmission areas".

"It is the intent of Congress that rate schedules . . . shall be determined with due regard to and predicated upon the fact that such electric energy is developed from water power created as an incident to" the construction of a navigation dam. They shall be drawn up "having regard to the recovery (upon the basis of the application of such rate schedules to the capacity of the electric facilities) of the cost of producing and transmitting such electric energy, including the amortization of the capital investment over a reasonable period of years." Costs shall be allocated by the Federal Power Commission, which "may allocate to the costs of electric facilities such a share of the cost of facilities having joint value . . . as the power development may fairly bear."

(9) The administrator shall keep accounts as prescribed by the Federal Power Commission, and shall make annual reports to Congress. All receipts shall go to the Treasury, which shall maintain, from such receipts, an emergency fund of $500,000 subject to check by the administrator.



NEW YORK WORLD'S FAIR WORKERS MOVE IN

Some 600 engineers, architects, administrative officers and clerical workers employed in creating the New York World's Fair moved into their new administration building at the fair grounds Aug. 16. The building, comprising 115,000 ft. of floor space, was completed in 124 working days at a cost of $900,000. It is fully air-conditioned. Though classed as a temporary structure, it is built of permanent materials. In the foreground is part of the 9-ft. chain link fence that will enclose the site and separate the various exhibit areas. Contract for the first three miles of fencing has just been completed by the Cyclone Fence Co.; many miles more are yet to be awarded.

New Highway Engineer In Texas

Julian Montgomery, who was recently appointed general manager and consulting engineer of the Willacy County, Texas, water control and improvement district No. 1, has been appointed chief engineer of the Texas highway department to succeed Gibb Gilchrist, who recently resigned to become dean of engineering at Texas Agricultural and Mechanical University. Mr. Montgomery's appointment is effective Oct. 1.

Mr. Montgomery is a graduate of Grayson College and has also received degrees from the University of Texas and the University of Illinois. His work at the University of Illinois was preceded by a year as assistant city engineer of Austin, Texas. In 1916, after the completion of his work at Illinois, he became city engineer of Sherman, Texas, and shortly thereafter city sanitary engineer of Austin. Work as office engineer, and later division engineer, for the Texas state highway department was interrupted by service as a lieutenant of engineers during the war. Then after brief service as county engineer of Rockwall county, Texas, and as city engineer of Wichita Falls, Texas, he started a general consulting engineering practice in 1922.

In 1934 Mr. Montgomery became state adviser to the National Planning Board and then state engineer and later state director of the PWA in Texas. He left the PWA to go with the Willacy county district last month.

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Pine View Dam Completed

The Pine View dam, largest item in the Bureau of Reclamation's $4,213,000 Ogden River project, was dedicated Aug. 14 and the dam was turned over by the bureau to the Ogden River Water Users Association.

The Ogden River project consists of the dam, a 5½-mi. 75-in. wood stave pipe line from the dam to the mouth of Ogden Canyon, a concrete-lined canal from the end of the pipe line north to Brigham City, a distance of 24 miles, and a 6¼-mi. canal from the pipe line south to Ogden. It will provide primary irrigation water for about 4,500 acres of land, supplementary irrigation for another 17,000 acres, and will furnish 10,000 acre-ft. of storage water annually to the city of Ogden for municipal purposes.

The dam, on which construction was started in October 1934, is an earth and rock-fill structure with a maximum height of 102 ft. above the foundation. The dam crest is 30 ft. wide and about 100 ft. long.

The cost of the Pine View dam is about $1,383,000.

Tenements Collapse In Heavy Rain

Nineteen killed as three Staten Island tenements are undermined and fall

Three 50-year old tenement buildings on Staten Island, New York City, collapsed Aug. 11 during a torrential rainfall. The buildings were swept off their foundations when the hollow in which they stood was flooded by the rain. The bodies of 19 residents were taken from the wreckage.

A borough building inspector had made a routine inspection of the buildings on the day preceding the collapse and had pronounced the three structures safe.

The three tenements stood on a narrow cobbled street which lies in a deep hollow surrounded on three sides by steep hills. On many occasions previously the cellars and sub-cellars had been flooded to a depth of 10 ft. At the height of the storm on Aug. 11 the cellars and sub-cellars were filled to their full depth of 22 ft. and water stood in the streets to a depth of more than 6 ft. Shortly afterwards the three buildings collapsed suddenly and were swept 50 to 100 ft. by the flow of water down the hillside.

The buildings were built from 40 to 50 years ago, according to their owners, to house workers in a now abandoned textile mill nearby.

An investigation is being conducted by the borough building department to discover whether any negligence was involved.

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Engineering Groups Select City Employees

The Joint Council of Associated Engineering Societies of St. Louis will prepare the competitive examinations for the eight smoke inspectors to be appointed under the new St. Louis smoke ordinance, and representatives of the Council will grade the papers of those taking the test. The St. Louis Efficiency Board will conduct the examination.

The smoke ordinance, which sets up qualifications for the inspectors, requires that they be at least 25 years old and be engineers qualified by technical training and at least five years experience in the theory and practice of construction or operation of furnaces and combustion devices. The charter provides that three names shall be certified in the examination for each job that is open, the job to be filled by any one of these three.

Bridge-Ferry Rate War

San Francisco Bay ferry fare is reduced below the bridge toll to permit operation of ferries

The San Francisco Bay ferries between San Francisco and Oakland and between San Francisco and Sausalito will be permitted to reduce their auto fare from 50 cents to 30 cents under a decision handed down by the railroad commission of California Aug. 9. The lower fare on the ferries, which compete with the two recently completed bridges on San Francisco Bay, is the outcome of a series of applications, hearings, and investigations which was started last fall. The ferries claim inability to operate under losses sustained since the bridges opened and hope to attract more traffic by the new low rates, which are lower than the present bridge tolls.

The California Toll Bridge Authority opposed the lowering of ferry rates on the ground that the saving to those using the ferries would be offset by a loss to the public due to increased interest which might result on future issues of bonds of the authority due to less profitable operation of the bridges by reason of ferry competition.

History of controversy

Before completion of the bridges, the ferry tolls were 85 cents for a car and five passengers. When the San Francisco-Oakland Bay Bridge opened (Nov. 11, 1936), the bridge tolls and ferry fares alike become 65 cents. Then on Feb. 1, 1937 bridge and ferries both reduced fares to 50 cents. The ferry company then applied to the commission for permission to reduce fares on passenger automobiles below the tolls charged on the bridge.

No attempt has been made to reduce truck tolls, because from the outset there was a preference on the part of motor truck operators for the ferry route. This arose from the advantages of a shorter haul, less gasoline consumption, avoidance of the bridge approach grades, and the opportunity of the ferry trip for truck drivers to eat and rest for a long non-stop run. Under these conditions nearly half the truck traffic still uses the ferry.

The decision of the railroad commission approved abandonment of two of the ferry lines and suspension for a six-month trial period of another, leaving one ferry from San Francisco to Oakland and one across the golden gate to Sausalito, and permitted the reduced 30-cent fare on these two remaining lines. The commission concluded on the basis of an investigation that, because of the time saving on the bridge, the reduced rate would not divert more than 5 per cent of the traffic from the competing bridges. It believed, however, that a new group of patrons would be attracted by the reduced fare and that this, in addition to the commercial traffic which the ferries keep, would give them a fair chance of being financially able to continue. The commission pointed out the public value of maintaining the ferry service as a stand-by in case of congestion on or accident to the bridge.

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Iron Workers on Strike In Louisiana City

A dispute between the iron workers union and the Lake Charles, La. general contractors caused stoppage of work on construction projects in Lake Charles, including a $275,000 Swift & Co. packing plant and improvements on the Mathieson Alkali Works. Union recognition and a wage scale of $1 per hour, as compared to the present scale of one-third that rate, are sought by the strikers.

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Want Quabbin Work Slowed To Reduce Taxes

Slowing down of construction work on the Quabbin extension of the Boston Metropolitan Water Supply's Wachusett system was proposed last week by the Boston Municipal Research Bureau as a means of reducing city expenditures and reducing taxes. The Bureau claims that since the present supply has a safe yield of 147 million gallons per day, while consumption is only 138 m.g.d. and is growing very slowly, no present need exists for the Swift River supply that is being developed by the Quabbin extension. Of the estimated project cost of $55,000,000 to $60,000,000, about $42,000,000 has been spent or committed. Principal items of remaining work are completion of the Quabbin Dam and reservoir clearing. The Bureau proposes that construction be slowed down sufficiently to limit expenditures during the next five years to the value of bonds retired, which is about $6,500,000.

According to Frank E. Winsor, chief engineer of the Metropolitan District Water Supply Commission, the Quabbin work is progressing at a rate not greater than that necessary for efficient construction, and it would not be practicable to defer any of the remaining items of work because of the requirements of existing contracts, protection of work already completed, and operating necessities.

Reclamation Charges To Be Studied

Commission will seek rational basis for remission of payment on reclamation projects

Appointment of a three-man commission to study financial and economic conditions on federal reclamation projects, with particular reference to their ability to make payments due the reclamation fund, is provided for in a bill passed by the House of Representatives Aug. 12. A similar measure was passed by the Senate last March, but differences between the two bills must be reconciled before Congressional action will be complete.

The purpose of the proposed legislation is to bring to a close the granting of general moratoriums on federal payments, common during the past five years, and to deal with each project individually in allowing the deferment of charges due. The commission will be composed of individuals familiar with irrigation farming problems and will be appointed by the Secretary of the Interior. It will be empowered to investigate the financial and economic status of any project applying for relief, to hold public hearings, and to recommend to Congress the best plan for rescheduling charges on a permanent basis.

The House and Senate bills differ in regard to payments due during the calendar year 1937. The Senate voted to grant all projects a blanket 50 per cent moratorium; the House leaves the matter to the discretion of the new Commission, subject to the approval of the Secretary of the Interior. The latter plan is more flexible, since it will permit the postponement of obligations, in whole or in part, on projects where returns have been unfavorable, while imposing full charges on those more fortunate.

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All Michigan Employees Under Civil Service

Governor Murphy of Michigan Aug. 3 signed the state civil service act which places all employees of the state government under the civil service. Under the bill, present employees must pass qualifying examination before next July 1 to retain their position.

Provisions are made in the bill for employee efficiency rating, a job classification plan, and standard compensation rates for each position. All new employees must take competitive examinations and accept a probationary rating for their first six months of service.

New Pollution Bill Passed by Senate

House bill made stricter by amendments permitting injunction proceedings

In a race to complete enactment before adjournment, the Senate on Aug. 16 passed a revised water pollution bill which, in effect, adds to the House-approved measure five additional paragraphs taken from a bill proposed by Senator Lonergan.

The net effect of the amended bill is to:

Create in the public health service a division of water pollution control headed by an assistant surgeon-general.

Direct this division, in cooperation with the corps of engineers and state and local authorities, to prepare comprehensive plans for reducing pollution in navigable waters and tributaries, and to promote the enactment of uniform state control laws and interstate compacts.

Authorize grants-in-aid by the federal government to local governments and industries for the construction of treatment plants.

Set up a board of five engineers in the Public Health Service to divide the country into sanitary districts, establish minimum pollution standards in each, and review plans submitted in applying for federal grants.

Declare that the discharge of waste into navigable waters in violation of the board's regulations constitutes a public nuisance, which may be proceeded against by federal injunction proceedings after the expiration of three years from the date of enactment, without nullifying the right of parties injured by pollution to sue.

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Cost Limit Raised On Housing

(*Continued from page 287*)

tribution of 15 per cent in the form of payments to labor.

Provisions of bill

The bill before the House now provides that a federal housing authority issue $500,000,000 of bonds over the next three years, $100,000,000 the first year, and $200,000,000 per year thereafter. The proceeds of the bonds will be loaned to public housing bodies and repaid with interest over a 60 year period.

The federal government will contribute annual subsidies to the local housing authorities in order to maintain low rents. The subsidies would be for a fixed amount arranged by contract between the government and the local authorities. Not more than $26,000,000 is authorized to be spent in subsidies over the next three years. Local communities must contribute 25 per cent of the annual subsidy necessary.

The administrative set-up, in the House bill, is made to center around an administrator who would receive $10,000 salary and would be advised by an unpaid board of nine members. The housing authority would be a part of the Interior Department.

Federal loans to the local housing authorities could not exceed 85 per cent of the cost of land acquisition and other expenses. Not more than 10 per cent of the funds may be expended in any one state, and not more than $5,000 per family unit may be expended on construction of any one project.

• • •

Engineer Staff Reorganized By Port Authority

Reorganization of the engineering staff of the Port of New York Authority has been effected with the appointment of O. H. Ammann, formerly chief engineer, as director of engineering. Mr. Ammann is succeeded as chief engineer by John C. Evans.

The changes, according to the Port Authority, were necessitated by the continuously heavy demand made upon the engineering forces. The advancement of Mr. Ammann is to make it possible for him to devote himself more fully to major engineering problems.

Mr. Ammann, during his service as chief engineer for the Authority, also served with the Triborough Bridge Authority as chief engineer in the construction of the Triborough Bridge, and he is now acting in a like capacity on the building of the Bronx-Whitestone Bridge. He was also a consultant in the design and construction of the new Golden Gate Bridge in San Francisco and was the designer of the George Washington Bridge.

Mr. Evans, the new chief engineer, graduated from the University of Pennsylvania in 1905. He was a designer and assistant bridge engineer for various railroads for several years and has made studies relating to freight and passenger terminal facilities in the metropolitan district. He has been terminal engineer for the Port Authority since 1928 and was also engineer of approaches for the Triborough Bridge Authority during the construction of the Triborough Bridge. More recently he acted as consultant to the New York City Tunnel Authority in planning the approaches to the Queens-Midtown Tunnel and the Battery-Hamilton Ave. Tunnel.

Steam Plant Permitted In TVA Territory

Tennessee Utility Commission permits power company to build steam plant at Nashville

The Tennessee Public Utility Commission announced Aug. 14 its decision to permit the Tennessee Electric Power Co. to build a $2,000,000, 25,000-kw. steam generating plant at Nashville in the heart of the TVA district. The decision was made against the protest of TVA protagonists. In reaching its decision, by a vote of two to one, the commission held that of the three proposals under consideration, steam generation, purchase of power delivered at Nashville by the TVA, and purchase of power from the TVA at Columbia, would be the cheapest. This opinion would be th cheapest. This opinion was based on the testimony of Wendell L. Willkie, president of Commonwealth & Southern, of which the Tennessee Electric Power Co. is a subsidiary, and on testimony from representatives of the holding company.

The dissenting minority opinion by the third member of the commission held that purchase from the TVA either at Nashville or at Columbia would be cheaper than steam generation.

It will now be necessary for the power company to apply to the Federal Power Commission for approval.

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New England Governors To Confer with F.P.C.

A request to the President from Governor Hurley of Massachusetts, that the President meet with the Governors of Massachusetts, New Hampshire, Vermont and Connecticut, to discuss the proposed New England flood control compact, has been met by a suggestion from the President that the governors meet the Federal Power Commission.

Governor Hurley's request followed a statement by the President (*E.N.-R.*, Aug. 12, 1937, p. 249) that he was opposed to ratification of the New England flood control compacts for the Connecticut and Merrimac Rivers, because, in the opinion of the power commission, ratification of the compact would involve a surrender of federal rights to power potentialities of the rivers.

A motion introduced into Congress would ratify the compacts subject to a provision reserving power rights to the federal government.

(*News continued on page 325*)

COMMENT AND DISCUSSION

Readers' opinions on matters that concern the engineer

Statement Held Misleading

SIR: Without concurring in any of the views set forth in the editorial "Down on the PWA?" in the issue of July 8, p. 51, but recognizing them as a matter of privileged editorial opinion, I wish to protest against one specific mistatement.

In the fourth paragraph of this editorial it is stated: "Further, the PWA has set up a system of federal control over local expenditure that is highly undesirable."

This broad statement is most misleading, and will certainly be misinterpreted by any persons not familiar with the detailed operations of the Public Works Administration. The Public Works Administration has not set up any system of federal control over local expenditure. The Public Works Administration has studiously avoided any such attempt to control local legislation and expenditure. This is not merely a matter of opinion but a matter of court record, as the issue has been decided in an extensive series of court decisions resulting from litigation concerning PWA municipal power improvements. No municipality is compelled or solicited to become a partner in a Public Works Administration project. Any municipality which undertakes a Public Works project does so voluntarily with full knowledge of the terms and the benefits. The construction, planning, etc., are done by the municipality—not by the Public Works Administration.

Because the Public Works Administration desires to protect its projects and the federal funds invested in such projects, its dealings with thousands of cities where varying local regulations and laws prevail, the engineers and architects, as well as craftsmen employed upon such projects, certain rules apply on PWA projects. These rules are for the purpose of seeing that engineers, architects and craftsmen are properly paid and properly perform the services for which they are partially reimbursed by government funds. These rules apply only to Public Works projects and funds involved in Public Works projects, and have met wide-spread approval.

In no sense can it be broadly stated that "the Public Works Administration has set up a system of federal control over local expenditure that is highly undesirable."

HORATIO B. HACKETT,
Assistant Administrator,
Public Works Administration.

Washington, D. C.
July 15, 1937

[Granting that the requirements outlined by Col. Hackett are necessary for the protection of the federal investment, they nevertheless impose a federal authority over local authority that we are convinced is undesirable. Any assumption by a federal authority of the power to determine whether a city's improvement proposal is worthwhile, whether the city has made proper preparation for the work, and later whether it has spent the money properly is an unfortunate departure from long established practice. This responsibility should remain on the local officials, and there should be no possibility of transferring any part of it to Washington.—EDITOR]

Effect of TVA Storage

Sir:—A letter of C. M. Roos, of Cairo, Ill. (*ENR*, July 22, 1937, p. 129) discusses the effect at Cairo of the Tennessee Valley Authority's control of the Tennessee River during the Ohio River flood last January.

It is surprising that an engineer who lives in Cairo should—so soon after experiencing the very serious flood when the flood wall protecting the city was topped by a depth of as much as nine inches of water and emergency works had to be provided on top of the wall to prevent innundation—attempt to minimize the value of river control which actually lowered the crest of that flood.

At the time of the January flood on the Ohio and Mississippi rivers the Authority had only three dams in operation: Wilson and Wheeler dams on the main Tennessee River just above Florence, Ala., and Norris Dam on the Clinch River, a headwater tributary of the Tennessee, 80 mi. above its junction with the Tennessee. Wilson Dam, constructed before the Authority was created, was not designed or built with provision for the storing of flood waters. Therefore only Wheeler and Norris dams, both constructed by the Authority, were available for flood control operation at that time. Norris Dam, one of the three proposed tributary stream dams, completely controls the flood runoff from about 2,950 sq.mi. of drainage area. This is only about seven per cent of the total area of the Tennessee River Basin. Wheeler Dam, one of the nine proposed main river dams, has a total drainage area above it of nearly 30,000 sq.mi., with only about 500,000 acre-ft. capacity for flood storage. This capacity of flood storage in this single main-stream dam is, of course, wholly inadequate to afford complete control of the flood runoff from above.

Obviously, with these limited storage facilities available in the two reservoirs at the time of the flood, nothing approaching adequate control of the flood waters from the Tennessee River could be expected. The Authority has never claimed and does not now claim it was able to *completely* control the flood waters from the Tennessee River during that great flood. It fully realizes it was unable to do so.

The flood at Cairo during the flood of January-February, 1937 remained above the dangerous stage of 58 ft. for about fifteen days, during which time about 964,000 acre-ft. of water was stored in Norris and Wheeler Reservoirs in the Tennessee basin. This represents an average reduction of about 32,000 cu.ft. per sec. from the flow contributed to the Ohio by the Tennessee River.

If these reservoirs had not been in operation during the flood, the Tennessee River would have contributed an average of 32,000 cu.ft. per sec. *more* to the flood throughout the fifteen-day critical period than it actually did contribute. The withholding of this volume of water probably reduced the maximum stages at Cairo by nearly half a foot. In other words, without this flood control on the Tennessee River the stage at Cairo might have risen about 15 in. instead of about 9 in. above the top of the wall at Cairo. This additional height would, of course, have been on top of the flood as it occurred and surely it would have been a serious menace to the city. Mr. Roos must recognize that this is correct even though the withholding of 32,000 sec.-ft. from the flood by the TVA dams was only a "drop in the bucket" as compared to the total flow at Cairo.

Sherman M. Woodward
Chief Water Control Planning Engineer
Tennessee Valley Authority

Knoxville, Tenn.
Aug. 2, 1937

No Need for Unions

Sir: Discussion by engineers as to the advisability of joining a trade union is becoming common. Those in favor seem to be young men, of the employee class. Their attitude is: "To Hell with professional ideals, we want more money, and the only way to get it is by joining a union." Since I also am a young man and an employee, may I express my opinion?

Those who favor a union say that since engineers have very small incomes, and mostly work for others, they should join a union. Engineers' incomes are small; but on the average no smaller than they should be. To receive more we must be worth more. If the mediocre and the downright bad engineers were eliminated from the profession, we would, as a group, be worth more, and would, individually, earn more. The trade union never eliminates the mediocre and the bad. It creates an artificial shortage, which in turn raises wages as well as the cost of completed work.

Leaving completely aside any questions of racketeering and favoritism by the business agent, labor unions fix wages and hours, and to some extent, duties. There is no opportunity to advance through merit, to take any job except that which the union gives one, nor any need to learn nor do more than is barely necessary. Engineers will not advance by that system. They will merely be dragged along, in spite of the trade union, by the force of civilization.

I am young enough yet, I hope, to have my future before me. The status of engineers lies with us, ourselves. What we need, I believe, are license laws to eliminate the quacks, the dishonest, and the negligent. We need technical societies and publications for our technical advancement. What we do not need are trade unions. We have no quarrel with the unions for tradesmen, but we are not tradesmen. Perhaps if a man intended to sit at a drafting table, doing one type of work all his life, or if a man were to be a rodman or a transitman until he died, a union would be entirely proper. But such a man is not an engineer.

Rockford, Ill.
Aug. 5, 1937

Raymond Wagner
Resident Engineer,
Division of Highways.

More Construction or Less?

Sir: Your issue of July 22, 1937, p. 123, gives the week's total construction awards as $30,695,000. That page shows this figure as smaller than for any previous week 1937 or 1936.

Your news comment is and has been that 1937 construction volume is above 1936 with rising tendency. The writer's personal experience is that for at least four months there has been a pronounced and increasing decrease of initiation of new projects, and what is available consists of projects that we would not have considered bidding three to six months ago.

The balance of 1937 appears much less promising than your news comments would imply. I think that the remaining weeks in which 1937 will exceed 1936 in dollar value will be few and infrequent. With the 1937 price index considerably higher than corresponding weeks in 1936, the physical volume in second half 1937 will be more pronouncedly under 1936. But I expect to see 1938 turning definitely strong.

Wheeling, W. Va.,
July 27, 1937

R. V. Engstrom
Engstrom & Wynn, Inc.,
Contractors

[As applied to public work the above analysis of the construction outlook agrees with detail figures. The 1937 gain reported by *Engineering News-Record* has been in private construction, principally buildings. In dollar volume, new construction to date is 15 per cent ahead of last year; private work shows a gain of 111 per cent, public work a loss of 20 per cent.

Fewer lettings have been reported this year. Lettings reflect public work rather than private. While the number of lettings dropped only 12½ per cent, the volume dropped 20 per cent, indicating smaller jobs on the average.

However, including all classes of work the number of construction reports has gained 8 per cent over 1936, while dollar volume has gained 15 per cent, due to higher average size of private projects. — Editor]

Earthquakes at Boulder

Sir: With reference to the report of continued small earthquakes at Boulder Dam reported in *ENR* July 29, p. 178, the question as to whether they could be caused by Lake Mead reminds me of the question I was asked, by my audience, when the Singer Tower (612 ft.) was built, about 28 years ago.

The question was: "Would not such skyscrapers overload Manhattan Island and cause it to slide into the Bay?"

My answer was: "The New York building laws only allow 15 tons per sq. ft. load on rock. That 15 tons is equivalent to 208 lb. per sq. in. or 104 lb. per half square inch.

"You gentlemen all know some dainty damsel who weighs 104 lb. whom you might imagine balancing her weight on a French heel of one-half a square inch. While she might make a great impression on you gentlemen, especially if she had her heel on your neck, she would make no impression on this board platform and certainly none on New York bedrock. Furthermore Manhattan could be covered with skyscrapers—more than twice as high as the Singer Building without exceeding the pressure per half a square inch of that damsel's 104 lb."

It would take a depth of about 500 ft. of water on one half square inch to equal that girl's 104 lb.

T. Kennard Thomson
Consulting Engineer

New York, N. Y.
July 30, 1937

P.S.: You used to think that lightweight reading matter was sometimes justifiable in *hot weather*, which is the excuse for the above.

ENGINEERING NEWS-RECORD
Copyright 1937, by McGraw-Hill Publishing Company, Inc.
Volume 119, Number 8
Editor, F. E. SCHMITT · *Editorial Staff,* V. T. BOUGHTON
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Editorial Offices at 330 West 42nd Street, New York
AUGUST 19, 1937

MUCH PLASTERING IS REQUIRED in the buildings of the 1939 Exposition at San Francisco, and in the natural course of events this would provide a large amount of work for plasterers and hod carriers. But will it? Time is short, and the Exposition authorities see in strikes a serious menace to the necessary rate of progress. In the epidemic of strikes that has swept the country the hod carriers of San Francisco, already getting $1.25 per hr., went on strike for $1.60 per hr., a rate out of all proportion to even the present extremely high wage scale. This unreasonable attitude of labor is making it necessary for engineers to design in such a way as to minimize the labor requirement. Substitutes for plaster may be well adapted to Exposition uses, and it is being urged that the specifications be changed to permit the use of such substitutes wherever possible. This is but one of the many instances where the unreasonable and unwise attitude of labor leaders is resulting in more harm than good for labor in the long run. Labor is but a part of the economic system, and shortsighted, dogmatic labor leadership, or even a Wagner Act, cannot thwart the natural law of economics for long.

Concrete for Sale

HIGH STANDARDS of merchandising have raised ready-mixed concrete to a prominent place among construction materials. In expressing this fact clearly the article on a following page deserves careful attention. It would have been easy, considering the beginnings of the industry a dozen years ago, for producers to have delayed progress in a highly economic service by inferior processing and vending. There was indeed real danger of this outcome when in the early days everyone who had a materials yard and a truck was dipping into the business of selling concrete as a side line. But there were also men who saw that the real market was beyond cellar walls and garage floors in buildings, roads and heavy engineering works. This meant producing to specifications that called for the most perfect materials and plant control. The industry organized to accomplish this; how it was done is told in the article in this issue. As an example of creditable technological growth the manufacture of ready-mixed concrete has a ranking place in the record of engineering material production.

Whose Responsibility?

BASIC QUESTION among the many arising from the collapse of Staten Island tenement houses with a death list of 19 is this: Whose responsibility is it to keep people from living in dangerous structures? Current investigations start with the assumption that the responsibility lies in the city's building inspection bureau; what of the owners of these 50-year-old structures? Present facts indicate that the houses were entitled to nothing but suspicion on the part of everyone who knew of their existence and that their collapse is clear evidence of neglect. But the discouraging fact is that lay owners often do not appreciate their responsibility for maintaining their structures in safe or humanly tolerable condition, and that public opinion has never impressed it upon them. And the fact that no city department orders or recommends changes in their structures leads them into a false sense of security. City building inspectors know when a building is on the point of collapse, but in the absence of minimum standards they have little power except in obvious emergency. And there are far too few inspectors to police even new construction, not to mention existing buildings. Until owners are made responsible for their buildings, until minimum standards for habitation are established, until building departments are given the personnel and the power to order unsafe structures razed, innocent people must continue to suffer.

No Time to Bargain

IF CONGRESS IS CONSISTENT it will quickly ratify the interstate compacts by which the New England states obligate themselves to carry out their part in the joint federal-state flood control for the region. The compacts are now being held up in Washington on the claim that they contravene federal power policy. Congress a year ago on its own motion resolved to control New England floods provided the states would contribute part of the cost and undertake to maintain and operate the works, and the compacts merely give formal expression to these states responsibilities. In view of this fact they should be ratified at once, so that the necessary work may proceed. Had Congress intended to make the federal flood-control subsidy contingent on the surrender of state rights over power, stream pollution or other elements of river use or regulation, it would undoubtedly have written such a stipulation into the original act. Having failed to do so, Congress should not now demand such surrender or allow the Executive Department to do so.

The compacts were strongly urged by federal authorities, were fairly and ably negotiated, and meet every requirement laid down by Congress in the Flood Control Act. At this time to use the Flood Control Act as a means of driving a hard bargain would be regrettable breach of faith.

Keep Them Modern

A NEW BUILDING code for New York City is an important document. Besides affecting nearly a billion dollars' worth of construction in a good year, New York building regulations are a model and reference standard for many other cities. A modern version of an excellent but outdated document, the new code in its modernity emulates the codes that cities the nation over have adopted during the past five years. And it confronts New York with a problem that these other cities, too, must face, namely the problem of keeping their codes continuously modern.

The old New York code served adequately for the first decade of its life, but during the next decade it became more and more obsolete. Machinery for its amendment, though available, was too complicated and inflexible, and the result was that uneconomic practices were perpetuated. For example, abandonment of solid 12-in. curtain walls and of too low working stresses and too high live loads was recognized as desirable but too difficult to attempt. Concrete designers were denied the demonstrated advantages of more scientific procedure; steel designers the privilege of using the principles of continuity; contractors and owners the savings inherent in controlled concrete mix design; and owners the benefits of new materials and new processes. Ultimately, therefore, a wholly new code had to be written—itself a very costly and cumbersome undertaking.

As it now stands the new code is, in broad aspect, adequate for safety and economy alike. Already, however, it and all other codes in the country are tending toward obsolescence under the pressure of scientific progress. Some means must be found to incorporate the fruits of this progress without waiting on the slow and cumbersome process of wholesale code revision. Some method for continuous revision of codes is obviously desirable. The primary consideration is that the procedure be in competent and impartial hands.

This end can be attained by setting up a standard board on building code, made up of independent engineers, architects, builders and experts in materials, which board would have the duty of carrying on a continuous study of need for code changes and reporting its findings to the city authorities. The responsibility for final action would remain with the legislature, but the influence of an expert board of recognized strength would virtually assure the adoption of its recommendations. Set up by the city authorities with the advice and cooperation of technical groups, and so organized as to have a stable but revolving membership, such a board would at all times promote building economy and safety and would be in the interests of civic progress.

Only rarely have municipal building codes been so closely in step with technical progress as today. Means should now be found to keep them in step. Continuing code revision under the advice of impartial building experts offers a promising possibility.

Costly Salvage

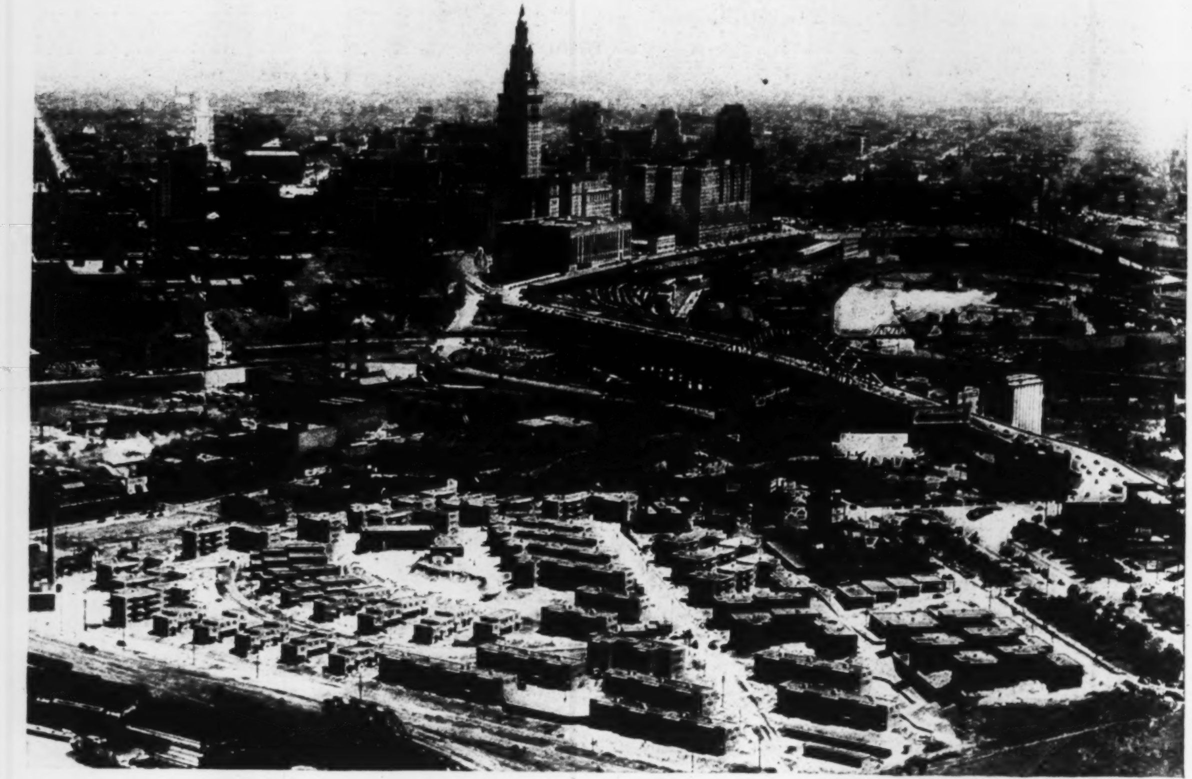
EVEN CALIFORNIA'S FAMOUS CLIMATE could not save the San Joaquin Valley orchard lands from destruction when the valley's water resources were wasted by prodigal exploitation. That is the lesson of the events leading up to the present inception of the Central Valley project, costliest salvage operation on record and a water development enterprise that will make a large river run uphill in order to supply its headwater regions from 300 miles away.

As a piece of engineering the project is of first rank. It has been studied with great thoroughness. It is certain to be as excellent in execution as it is sound in plan. From the economic viewpoint, however, the answer is less assured. The total count of benefits probably exceeds the cost, though conclusive figures are not yet available. But return of the federal government's investment in the project is less assured; according to current reclamation practice, the government may get its money back in sixty to seventy years, without interest.

It is obviously wiser to avoid the need for such expensive salvage operations than to court the technical and financial risks which they involve. Had California taken proper care of its water resources by preventing overdevelopment of land and overdraft on its water supplies there would be no Central Valley project today. That it did not do so is in part due to ignorance of facts; neither the state nor its landowners knew how much water was available; neither river water nor groundwater was adequately protected as to appropriation and use.

In the failure to protect its water resources California is by no means alone. Groundwater exhaustion, main reason for the Central Valley project, is known to threaten many other regions, and not all of them have a Sacramento River at hand for salvage purposes. If further salvage projects of the type of Central Valley are not to become necessary, adequate state guardianship of streamflow and groundwater is imperative.

PICTURES IN THE NEWS



Public Works Administration Photo

CLEVELAND'S *Lakeview Terrace slum clearance project lies close to the business section of the city, roughly marked by the Terminal Tower. This $3,800,000 PWA project will accommodate 620 families.*

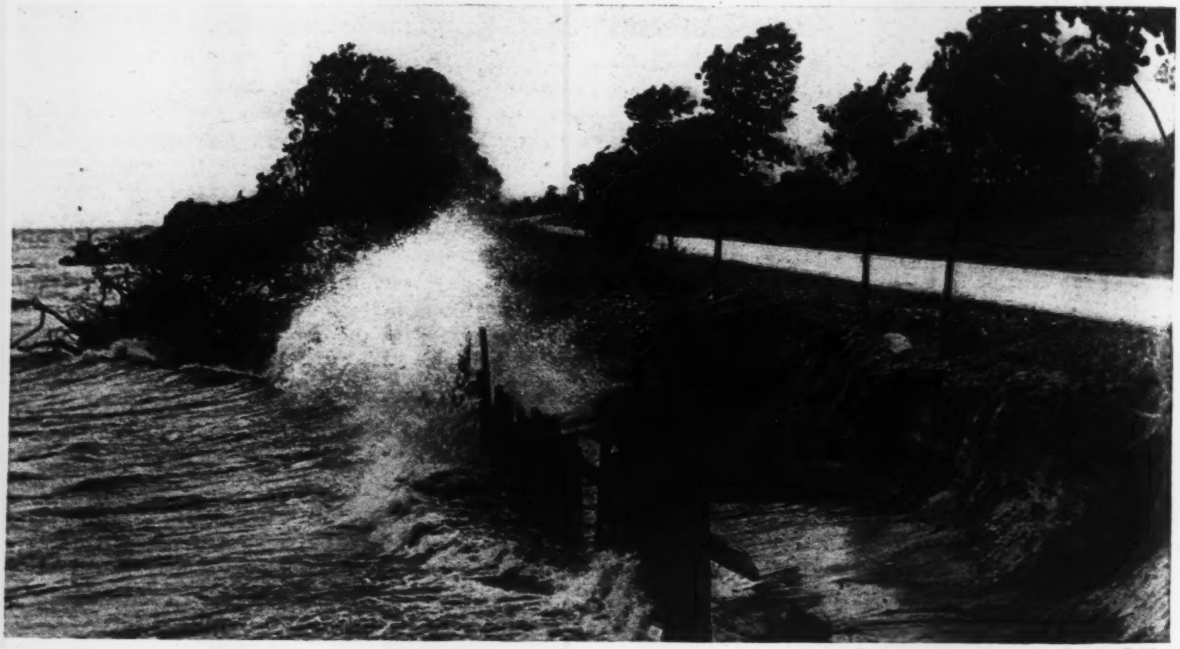


Photo by B. S. Britton

STORMS *on Lake Erie recently threatened the highway in Peninsula State Park at Erie, Pa. The makeshift plank breakwater is to be replaced with steel sheetpiles as an extension of an existing wall.*

SOME 400,000 ACRES OF THIS HIGHLY DEVELOPED LAND FACES DESTRUCTION FOR LACK OF WATER

Desert Menace in the San Joaquin

Because much of the valley that is California's garden spot is reverting to desert, the boldest and most picturesque water project of modern irrigation history is being undertaken

The great Central Valley project, still in its initial stages, is the least known of our current national development enterprises of large magnitude. The present article, prepared from authoritative data, outlines the menacing conditions which the project is designed to correct, as well as the many complex factors involved in the work. —EDITOR

EIGHTY-EIGHT years ago the gold rush brought to California an eager army of fortune seekers. Most of them remained as settlers, and their energy within a few years developed the region more than it would have developed in generations without their aid. Those who tired of mining turned to agriculture or cattle raising, attracted by the fertile soil and mild climate of the Sacramento and San Joaquin valleys. The bottom lands of the wide basin in the center of California formed by these valleys became a garden spot.

But within the last decade thousands upon thousands of acres of these lands have dried up—literally gone back to desert—and the future of the valley is in the balance. No remedy is at hand except the formidable undertaking of bringing in surplus water from the upper reaches of the Sacramento River to the Delta and to the San Joaquin. To bring down this water is the purpose of the federal government's newest great development enterprise, the Central Valley project.

Why are the orchards and fields of the southern San Joaquin drying up, and how will the Central Valley project save them? The answer forms a remarkable story of engineering development.

The San Joaquin irrigates

In the sixties and seventies, after the gold-rush settlers turned to farming, there always seemed to be room for more settlers in the region. If land holdings were large, so were the valleys; if roads were poor, crops moved by water and communication was by horseback. Time was not pressing and, although agricultural expansion went on continuously, the rate of development and exploitation was not rapid until about the break of the century.

From about 1900 on, irrigation was in the ascendancy and growth speeded up. Many irrigation systems were constructed, and this development continued until, within the past twenty years, the irrigated area in the Sacramento and San Joaquin valleys has increased to nearly 3,000,000 acres. This is more than the total irrigated area in all the projects built by the U. S. Bureau of Reclamation.

Most of this development was the result of local enterprise and financing; the larger systems were built and operated under the state's irrigation district laws, dating from the late eighties. Irrigation is necessary because, despite the amount of rain-

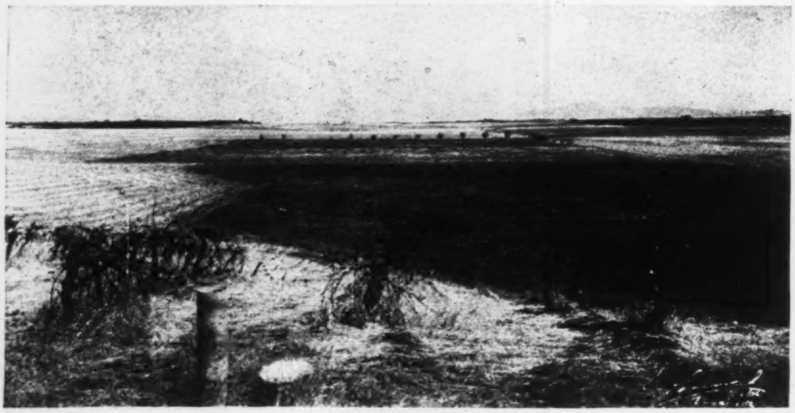


Fig. 1. Desolate scenes replaced fertile irrigated farms of the south San Joaquin Valley when water supplies failed. Contrast this view with Fig. 2 taken from the same spot some years previous.

fall, and despite the fact that much water runs to waste in flood seasons, the water is not available at the times and places where it is most urgently needed.

The Sacramento River, flowing southward, and the San Joaquin, flowing north, meet in a network of channels forming a common delta near the middle of the state, whence there is a common discharge westerly into San Francisco Bay through a gap in the hills. The two river basins combined, known as the Central Valley of California, include a valley-land area roughly 500 mi. long by 40 to 50 mi. wide. Except for the one gap just mentioned the basin is completely surrounded by mountains; in the Sierra Nevada on the East the passes are at elevations of about 7,000 ft. and peaks range up to 14,000 ft.

Precipitation is heavy in the high mountain areas, especially in the northern part of the basin. Most of the rain and snow comes in the winter months, which means ample streamflow in the spring and early summer, but low water later in the crop season. Unlike agricultural areas in the East and Middle West, the valley receives little or no rain during a large part of the growing season. Thus the long and warm summer, favorable to a wide variety of crops where water is available, early led to irrigation, principally in the south, which has less water and longer, warmer summer seasons.

In the Sacramento, irrigation from the rivers continued to be generally adequate. But the San Joaquin's available summer reserve was early exhausted, and the growers turned to underground water. Wells were sunk—at first shallow wells, then progressively deeper ones as efficient deep-well pumps were developed and electric power became available everywhere—and whole counties came to depend on the water from these wells for their existence.

When water failed

In the early years of agricultural development in the San Joaquin, if there was any thought of the ultimate water problem nothing was done about it. Large tracts of land were brought under cultivation, and the draft on streams and on the groundwater became ever greater. Extension of use of river water was limited by prior appropriations, but no such recognized doctrine of law protected the groundwater.

As years went by, despite the warning of a few farsighted individuals the development of land continued, until more than half the irrigated area in the southern San Joaquin valley came to depend in whole or in substantial part upon underground water supply. In due course the combined installed capacity of irrigation well pumps in this area, more than 20,000 sec.-ft. (13,000 m.g.d.), came to extend the rate of replenishment of the underground basins by a large margin.

The dry years of 1918 to 1920 caused lowering of groundwater to a critical depth in many parts of the south San Joaquin Valley. Some land that lost its water supply at that time was irrigated later with water from deepened wells and better pumps, only to cause water levels to go on down beyond economic reach. Abandonment of orchards and vineyards on a rather extensive scale began about 1924. From 1927 to 1935 there were only a few years of reasonably good rainfall. For the most part this was a dry period: the years 1931 and 1934 were particularly dry. Little statistical information has been compiled about land abandonment in the last five years because the attention of state authorities and the use of state funds has been concentrated on the Central Valley project. However, present estimates are that about 50,000 acres of improved land that once produced effectively under irrigation in the south San Joaquin is now going back to desert conditions.

A report of the U. S. Senate committee on irrigation and reclamation in 1932, following extensive investigation, said of the southern part of the San Joaquin valley: "Of some 400,000 acres of developed and producing land there is sufficient water on the average for only half of the area. The conclusion is unavoidable that some 200,000 or more acres of these highly developed and producing lands will have to be abandoned and go back to desert unless some means is found and adopted in the near future for bringing in additional water supply."

The menace pictured in these words confronts an area in which the investment is $100,000,000 and the normal crop production is $40,000,000 annually.

This critical situation in the south San Joaquin has been approaching very definitely since uncontrolled pumping began, more than 30 years ago, but so long as the danger was not immediate little definite planning was done. There is no prospect for an additional water supply from the south, because all available sources there are fully utilized. To the north there is floodwater that wastes into the sea, but it is at great distance.

When the first proposal was made to bring water from the Sacramento River it was decried as chimerical, because the proposed source was 350 miles from the area that needed the water. Subsequently, the difficulties of bringing in the northern supply diminished somewhat as they were given more intense study.

Supplementary benefits of Sacramento River storage also began to be recognized; among them are improvement of navigation, control of floods, power development, and the highly important matter of checking the advance of salt water incursion in the delta region.

On the other hand the legal and financial problems of the scheme did not simplify on closer inspection. In large measure they still remain to be definitely and finally worked out.

Long-range planning

Intensive investigations of water problems of the south San Joaquin were started under state legislative authorization in 1921. More than $1,000,000 has since been expended by the state in comprehensive studies that exhaustively analyze all phases of the state's water resources. These studies were followed in 1933 by state legislative action authorizing a water conservation and development program, the Central Valley project, to be constructed as soon as sufficient funds could be made available. This act provided for enlisting and accepting federal aid.

Even before this date federal interest in the project had begun. As early as 1929 federal committees studied the proposed scheme of development, and several committees and commissions approved it. Finally, under date of Nov. 26, 1935, Secretary of the Interior Ickes reported to the President that the project is "feasible from engineering, agricultural and financial standpoints, adaptable for settlement and farm homes, the estimated construction cost is adequate: the anticipated revenues will be sufficient to return the cost to the United States. I recommend the approval of the Central Valley development as a federal reclamation project." This report was approved by the President on Dec. 2, 1935.

An element that delayed a definite program for the Central Valley project was the unusual extent of ramifications involved. Many phases of the project are interrelated, and to be generally acceptable a solution must take them all into account. Eventually, this was accomplished in an all-inclusive program that is fairly characterized as the boldest and most picturesque scheme of modern irrigation history.

This scheme, estimated to cost a total of $170,000,000 begins with a major storage reservoir in the upper reaches of the Sacramento (Kennett Dam) which will provide: (1) flood protection; (2) improved navigation by regulated streamflow in the Sacramento and San Joaquin rivers; (3) check to the salt water incursion that has menaced the delta lands, made industrial water supplies brackish; (4) storage of previously wasted flood waters for irrigation use in the San Joaquin valley, and (5) a valuable byproduct of flood storage in the form of power.

Besides Kennett Dam the scheme includes a series of pumping plants for lifting Sacramento River water into the San Joaquin via a canalized portion of the river and a supplementary canal system; Friant Dam for storage of water on the upper reaches of the San Joaquin; and attendant canal systems north and south from Friant.

In December, 1935, the undertaking became a federal project; construction to be carried on by the U. S. Bureau of Reclamation; California to take over operation and maintenance after construction is completed.

State and federal partnership

The working agreement between federal and state authorities is a "cooperative contract for completion of investigations, negotiations of contract, and acquisition of property, between the United States of America and the state of California." The original agreement (March 25, 1936) and a supplemental agreement (March 13, 1937) were signed by R. F. Walter as chief engineer of the U. S. Bureau of Reclamation and Earl Lee Kelly as chairman of the California Water Project Authority.

This latter body is the official administrative agency created by state legislative act for the purpose of carrying the project to completion. Its five members are the director of public works, the director of finance, the attorney general, the state treasurer and the state controller. The state engineer (Edward Hyatt) is executive officer; a deputy state engineer (A. D. Edmondson) is acting secretary. Technical activities of the authority are carried out by the engineering staff of the state division of water resources under direction of the state engineer.

An executive order of the President on Nov. 16, 1935, made available for the project $15,000,000 from the emergency relief appropriation; this allotment later was reduced to $4,500,000. The 74th Congress appropriated $6,900,000 for continuation of the project, with the proviso that of this sum $6,000,000 shall be available for constructing the Friant reservoir on the upper San Joaquin River and irrigation facilities therefrom in the San Joaquin basin. A direct contribution of $12,000,000 by the federal government for the construction of Kennett reservoir on the supper San Joaquin River was authorized in the Rivers and Harbors Act passed by Congress.

Funds allocated up to the present

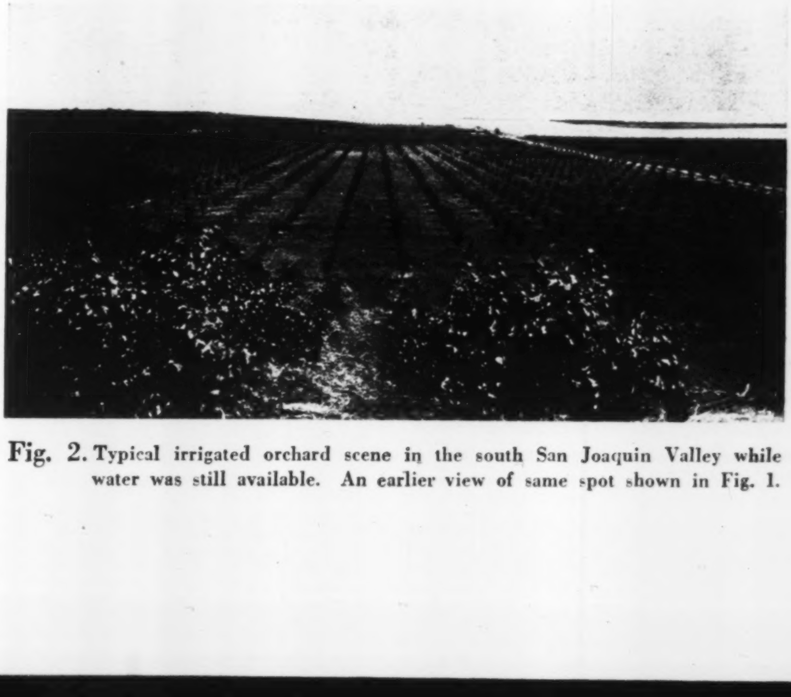


Fig. 2. Typical irrigated orchard scene in the south San Joaquin Valley while water was still available. An earlier view of same spot shown in Fig. 1.

time amount to $11,400,000. The terms of the federal allocations and appropriations are that funds advanced shall be reimbursable in accord with the reclamation laws (reclamation precedent will require contracts for repayment in 40 years). President Roosevelt officially approved the beginning of construction before repayment contracts were executed. State officials expect the project to be self-liquidating through revenues to be received chiefly from the sale of water and power.

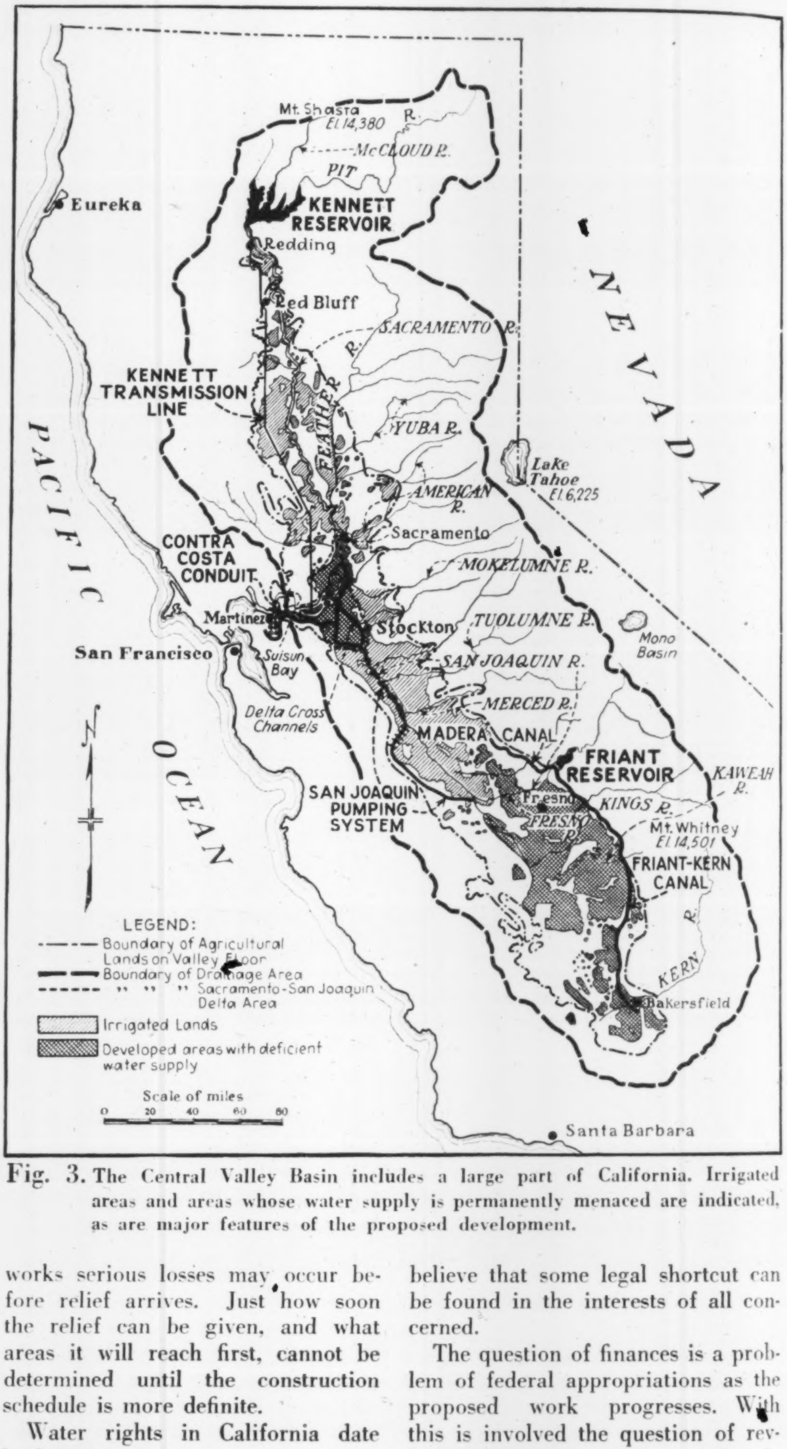
The U. S. Bureau of Reclamation took over the federal phase of activity on the project at the end of 1935 and since then has functioned as the construction agency. Work done so far includes surveys and land appraisals, preparation of plans and specifications for the proposed works, letting contracts, and generally supervising such construction as has been done. Field crews are under the direction of Walter R. Young, construction engineer, with headquarters in Sacramento. Preparation of plans and specifications is carried on in the Bureau's Denver office under direction of R. F. Walter, chief engineer.

Power a byproduct

Power production is an inseparable part of the project because, where water is stored on the upper Sacramento River, a relatively small addition to the investment makes possible the development of large blocks of power. Revenue from power sale is expected to repay about half the cost of the entire project. Accordingly, a power installation at Kennett Dam has been planned for 300,000 hp. and is expected to produce about 1,500,000 kwh. annually.

About one-sixth of the power produced will be required to meet the pumping needs of the project. The remaining power will be available for disposal in the general power market, which is expected to absorb it readily. Preliminary requests for the power already have been made by public and private agencies, though the policies and terms under which power will be sold have not yet been announced. No power is to be produced at Friant Dam.

The San Joaquin water need has become urgent and if there is much delay in completing the proposed works serious losses may occur before relief arrives. Just how soon the relief can be given, and what areas it will reach first, cannot be determined until the construction schedule is more definite.


Mt. Shasta
El. 14,380
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McCLOUD R.
PIT
KENNETT
RESERVOIR
Eureka
Redding
Red Bluff
SACRAMENTO R.
NEVADA
KENNETT
TRANSMISSION
LINE
FEATHER R.
YUBA R.
PACIFIC
Lake
Tahoe
El. 6,225
AMERICAN R.
Sacramento
CONTRA
COSTA
CONDUIT
MOKELUMNE R.
Martinez
Stockton
TUOLUMNE R.
Mono
Basin
San Francisco
Suisun
Bay
SAN JOAQUIN R.
Delta Cross
Channels
MERCED R.
MADERA CANAL
OCEAN
FRIANT
RESERVOIR
KAWEAH R.
SAN JOAQUIN
PUMPING
SYSTEM
Fresno
KINGS R.
FRESNO R.
Mt. Whitney
El. 14,501
FRIANT-KERN
CANAL
R.
KERN R.
Bakersfield
LEGEND:
Boundary of Agricultural Lands on Valley Floor
Boundary of Drainage Area
" " " Sacramento-San Joaquin Delta Area
Irrigated Lands
Developed areas with deficient water supply
Scale of miles
0 20 40 60 80
Santa Barbara

Fig. 3. The Central Valley Basin includes a large part of California. Irrigated areas and areas whose water supply is permanently menaced are indicated, as are major features of the proposed development.

Water rights in California date back 80 years or more in some cases, and complex legal problems are involved. For example, a suit brought by delta land owners some years ago named a list of 600 defendants. The diversion of water from one basin into another and particularly the complicated water-right questions at Friant Dam site are likely to involve difficult legal problems. State authorities hope but probably do not believe that some legal shortcut can be found in the interests of all concerned.

The question of finances is a problem of federal appropriations as the proposed work progresses. With this is involved the question of revenue from power, not yet definitely settled in its relationship to the financing of the project as a whole. The San Joaquin Valley's future, in short, depends wholly on Uncle Sam.

Central Valley Data

That part of the Central Valley that can be rated as "valley" land totals about 18,000 sq.mi. in area. The total area of the basin is 58,000 sq. mi.; the total population nearly 1,000,000 of which 43 per cent is urban. Large cities include Sacramento (state capital, population 100,000) Stockton, Fresno and Bakersfield. Agriculture, the major industry, is supplemented by manufacturing, consisting chiefly of processing, packing and preserving farm products. Of mineral production, petroleum is important. The total value of agricultural products from the Central Valley approaches $500,000,000 annually.

About 1,000,000 acres in the Sacramento and San Joaquin valleys are irrigated wholly or in part by water pumped from wells, of which there are about 31,000. More than $100,000,000 is represented in flood-protection and drainage works that have been constructed to serve about 1,500,000 acres of swamp and overflow land. Another $50,000,000 has been spent for flood-control levees and bypass channels.

Annual rainfall in the Central Valley as a whole averages only 10 to 20 in. However, on the western slopes of the Sierra Nevada the average precipitation is as high as 80 or 90 in., much of it stored through the winter as snow, to run down into the valleys in spring and early summer.

Hydro plants built on Central Basin streams have total installed capacity of 1,500,000 kw. and supply three-quarters of the electric power used in northern and central California.

The Sacramento River is rated as navigable for 250 miles, up to the city of Red Bluff; the San Joaquin River for 130 miles to the confluence of the Merced River. These ratings are misleading since decreased streamflow of recent years has made channel depth inadequate.

In the delta region some 400,000 acres produce crops valued at $30,000,000 annually. These lands have been reclaimed at great cost over a period of 75 years. In 1931 salt water incursions caused crop losses estimated at $1,300,000. Productivity of the delta area depends upon maintaining fresh-water supply in the 500 miles of delta channels. Similarly, on the shores of Suisun Bay, just west of the delta, salt water incursions have interfered with the water supply of industries whose manufactured products have an annual value of $112,000,000. Protection against this incursion by means of a salt water barrier in upper Suisun Bay has been proposed and was the subject of an exhaustive study some years ago by the U. S. Army engineers, who reported against building such a barrier.

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July 19, 1934 p. 85—Abstract of Am. Soc. C. E. paper and discussion.

May 2, 1935 p. 651—Appointment of committee to study the project.

Oct. 17, 1935 p. 552—Dr. Mead announces plans and financing.

Mar. 12, 1936 p. 394—Progress to date on field work.

Mar. 12, 1936 p. 398—Editorial comment on state and federal partnership.

July 16, 1936 p. 89—Proposed works, particularly on Friant division.

Feb. 18, 1937 p. 280—Contra Costa canal contract to be let soon.

Merchandising Designed Concrete

by H. F. Thomson

Vice-president, General Materials Co., St. Louis, Mo. and former president, Ready-Mixed Concrete Association, Washington, D. C.

Permanent plant and a stabilized trade are bringing a high degree of standardization and quality control in the new business of producing and delivering ready-mixed concrete to constructors

The manufacture and servicing of ready-mixed concrete has developed a technology that is ranking it among the standard materials of construction. With the increasing use of ready-mix, knowledge of this technology is important so that the user may know what he may reasonably ask in quality and variety of product and in volume, regularity and distance of delivery. An experienced producer answers these questions and gives facts that will be surprising to many engineers who have not closely followed recent developments.

— Editor

In a dozen years the buying of ready-mixed concrete has become approved engineering practice. Swinging into production just before the depression, this business like others in capital goods suffered a setback in sales but now like the others may be expected to come back with better conditions. It is indeed likely to be stronger in the future because of accelerated invention and improved technology developed during the duller merchandising period.

Specifications for quality and standards for plant have been worked out by the technicians, but further than this the equipment engineer has improved his product until today, whether for central plant mixing or for mixing in transit, vastly improved machines and devices for manufacture and control are available. [A succeeding article will present these advances in truck mixers. —Editor.] And now the construction engineer can confidently buy from the better sellers of ready-mixed concrete a variety of mixes and a degree of quality that will meet every construction requirement and technical test that he will ordinarily impose.

A new order of business has grown out of these elements, one with a precise technology and a guarded reputation for reliability. The standards of this business, its limitations and its function in concrete construction are told in the article that follows. It is important that the subject should have attention, for ready-mixed concrete is in the construction field to stay and it is in the interest of its users and of its producers to keep it on high plane of service to engineering.

The term ready-mixed concrete is now well established as identifying a mixed concrete which is delivered to constructors ready for use. It has the official sanction of adoption by the American Society for Testing Materials, the American Concrete Institute, the American Road Builders Association, and the National Ready-Mixed Concrete Association in their respective specifications.

Central mixing plants are commonly permanent installations located in metropolitan areas. Many of them were originally established to serve street or highway paving work requiring large volumes of concrete of relatively low slump, which could be hauled for reasonable distances in dump or bath-tub bodies without troublesome segregation. More recently, with the growing use of ready-mixed concrete, central-mixing plants have generally adopted some type of agitator truck body to keep the load in uniform condition during delivery. An adequate agitator body will deliver concrete in satisfactory condition regardless of the slump, within any reasonable length of haul.

Central mixing

The common central-mixing plant consists of a multi-compartment overhead bin from which aggregates are batched by weight into a stationary mixer, which in turn discharges into the delivery truck. The mixer is usually of 2 to 4 cu.yd. capacity; the size should be coordinated with the capacity of truck unit, to avoid the inefficiency of putting fractional batches through the mixer. Cement is handled either in bulk or in bags; there has been a growing trend toward using bulk cement, but in a metropolitan district where it may be necessary to use different brands of cement in successive batches, or where cement tested by various agencies may be required, the sole use of bulk cement may require complicated mechanical arrangements at the plant. Water is measured accurately, either by weight or volume; automatic cut-off and timed introduction in relation to the dry materials, aid uniform production.

The important property of central-mixing is the concentration of control of proportioning and mixing under adequate supervision at the plant.

The agitator body most used in commercial plants is the revolving drum, driven by a separate auxiliary engine or by a power take-off from the truck transmission. Drum-type agitator bodies are similar to truck-mixer bodies except that they do not include a water-measuring tank and water-distribution system. A larger quantity of central-mixed than of truck-mixed concrete can be hauled in a given drum-body, because in the latter case the materials are unmixed when loaded and the voids in the coarse are unfilled by the finer particles.

Truck mixing

In recent years the preponderant development has been in truck-mixing. The investment in plant is less than for central-mixing, although the investment in delivery equipment for a given rate of delivery may be somewhat higher. Truck-mixing is as readily adaptable to small as to large installations; the same precision of control as in central mixing, should be exercised. Basically the operation involves merely the charging of requisite quantities of aggregates, cement and water to the truck-mixer; dependence is commonly placed on the truck driver to run the water into the drum and to rotate the drum sufficiently, prior to arrival at the job, to produce uniform concrete. The mixer trucks usually carry water tanks which are equipped with gages for measuring the water entering the drum; or in a growing number of installations, the mixing water is measured by meter or tank at the proportioning plant and introduced into the drum along with the aggregates and cement, thus permitting accuracy of measurement and obviating the need for a water tank on the truck.

The very simplicity of truck-mixing has aided in inducing many having facilities for handling concrete materials, such as dealers in building materials, to add a number of truck-mixers to their equipment, and thereby place themselves in position to offer delivery either of dry materials or of mixed concrete. But this comparative ease of entering the ready-mixed concrete field by the installation of a few truck-mixers, also offers a serious hazard to the industry as a whole through the addition of some operators who may not understand or are unable to meet the technical requirements of such a specialized business. Although the possible disrepute resulting from the activities of unqualified or poorly equipped factors is recognized as a potential hazard to the future success of the industry, to date there have been few such instances and the industry now enjoys a favorable reputation for responsibility.

Aside from the operating reliability of the plant and delivery equipment, two important requirements should characterize a responsible ready-mixed concrete service. Foremost, there should be adequate technical supervision of all operations. Such supervision should check the characteristics of the materials, including gradation and moisture of the aggregates; it should be capable of designing mixes to meet all manner of specifications, including volume proportions, cement content and strength requirements; it should make frequent cylinder tests of the concrete furnished, in order to inform both the producer and the customer of the quality of the concrete, and it should be in position to advise with both designers and contractors, as to the characteristics of the concrete that will economically meet the requirements of each job. The operator of a small number of delivery units may have difficulty in furnishing personnel to accomplish such supervision, but as each operator in ready-mixed concrete has undertaken to enter a specialized and technical field, he owes to his trade a degree of control of the operation which is far beyond that previously expected in connection with the sale and delivery of concrete materials.

Possible length of haul

Under most circumstances concrete can be hauled safely for a longer time and delivered at greater distance from the loading point than the economic conditions will justify: the range of delivery is limited by cost of delivery rather than by the physical condition of the concrete. A common provision for time of haul is as follows: "The concrete shall be delivered, and discharged from the truck-mixer or truck-agitator, within a period of $1\frac{1}{2}$ hr. after the introduction of the mixing water to the cement and aggregates." This time of $1\frac{1}{2}$ hr. does not have to be held rigid because under especially favorable conditions periods up to 2 and 3 hr. may be allowed. Even under unfavorable conditions of high air temperatures or an unusually quick time of set, it is unlikely to be necessary to reduce this time to less than 1 hr.

When it is realized that the $1\frac{1}{2}$ hr. provision permits driving the load as far as 20 to 25 mi. from the loading point, it is apparent that under normal conditions the limitation to the area of delivery is that of the cost of trucking rather than the condition of the concrete itself. Actually, a reasonable regular practice as to deliveries in a metropolitan area might be suggested as up to 6 to 7 mi. from the loading point. On the other hand, satisfactory deliveries up to 25 to 30 mi. are by no means uncommon. This, of course, means that a ready-mixed operation is in position to offer delivery service from a single central point throughout almost any of our cities, except possibly a few of the largest metropolitan areas.

Non-agitated delivery

It has also become recognized that there is a place for non-agitated delivery in dump trucks from a central-mixing plant, under special conditions of short haul or stiff concrete, as may obtain in case of a plant in the vicinity of an extensive job or on certain paving work where a low-slump concrete is used. Under favorable conditions of using well-graded aggregates and delivery in dump-bodies having rounded corners, satisfactory service has been given in hauling 2-in. slump concrete for about 6 mi. and 5-in. slump concrete for about 1 mi. Where the circumstances permit their use, delivery in dump-trucks may cost somewhat less for truck expense than delivery in agitators.

Delivery rate and volume

With adequate plant and delivery equipment, it is usually possible to deliver at any rate that the normal personnel on the job can handle the material; the requirements seldom exceed 40 cu.yd. per hr., but many of the large city plants have greatly exceeded this rate for jobs requiring especially fast service. A feature of special interest to the contractor is that the rate of delivering ready-mixed concrete will usually exceed the rate at which concrete could be mixed on the job in equipment which the size of the job would justify the contractor in using. Consequently the introduction of ready-mixed concrete has tended to speed up the rate of placing concrete.

In the matter of size of loads to be delivered, a wide range of practice has grown up in different localities. In several of the eastern cities where very heavy paving has been built, loads of 4 to 5 cu.yd. of mixed concrete are common and some equipment has been furnished to handle 6 cu.yd.; such heavy loads are usually handled on either double-rear axle or semi-trailer truck equipment. As in other transportation, the handling of large loads usually results in reducing labor cost per unit delivered, which has been the justification for such large bodies. However, in many of the middle western states, there are rigid limitations upon the gross weight of trucks using the state highways, and even though the local city regulations might permit heavier loads, the frequent use of the state highways tends to limit the size of load to be adopted. This load is frequently 2 cu.yd. of concrete, although a judicious distribution of the weight on the chassis may permit handling up to 2½ cu.yd. on a four-wheel truck and stay within the axle loads usually specified in connection with a total weight limit of 24,000 lb. Loads of 2 to 2½ cu.yd. offer a desirable flexibility in delivering to moderate size jobs, and also permit driving on sub-soil which would not support very large loads. For installations in small cities where most of the jobs are residences and store buildings, it is common to use trucks of 1 to 1½-yd. capacity.

An important factor in the successful operation of a ready-mixed concrete plant is the fullest cooperation between plant and job. Even though the plant extends its best efforts to deliver concrete as and when wanted, lack of cooperation at the job may make the use of ready-mix impracticable. In order to establish the desirable liaison, contact should be made with each large job prior to important pours, so that the delivery service to be furnished and the method of handling the concrete after delivery, shall be mutually understood. If the pour is below grade and the concrete can be handled by chute or buggies direct from the truck to the point of placement, the problem for the ready-mix plant is that of delivering the required consistency at the rate agreed upon. But if hoisting or other special handling is involved, then the ready-mix representative can offer the job superintendent the benefit of his company's experience in servicing similar situations. Frequently a receiving hopper between the truck and the skip is desirable to minimize the time lost by trucks in dumping, and as the ready-mix companies usually do not furnish hoppers or other equipment beyond the short discharge chute of the truck, there is opportunity to advise the superintendent regarding the best type of receiver to be used and the general arrangement at the job which will be mutually satisfactory.

Telephone information

If, during the course of the pour, the job wants any change in consistency or rate of delivery, either faster or slower, or if deliveries are to be held up for any reason, such word should be telephoned to the plant immediately; sending word by a returning driver is unreliable and wastes the time of the return trip. Conversely, after the plant has undertaken to deliver at a given rate, every effort should be made to maintain the promised schedule, as any delay may be expensive to the job through the cost of idle crew or extending the work into overtime, and thereby become a proper basis for complaint by the customer. But with full cooperation between plant and job, a uniform and suitable concrete should arrive at the rate for the job crew to place effectively, and the over-all efficiency which should be incident to using ready-mixed concrete can be accomplished.

A specified product

When the use of ready-mixed concrete began to expand some years ago, there became apparent a need for specifications to cover this addition to the list of building materials. Various purchasing agencies and several national associations adopted specifications which were more or less specialized. Such specifications were largely a matter of local use until a committee of the American Society for Testing Materials undertook in 1933 to draw up a comprehensive "purchase specification." This specification, now known as A.S.T.M. serial designation: C94-35, went through the usual procedure for development and was adopted as an A.S.T.M. standard in 1935. This specification covers the important features of materials, composition of concrete, measurement, mixing, delivery, inspection, testing and acceptance. The practice is growing among specification writers to refer to this specification as covering the major requirements of the concrete to be furnished a job, with designation of one of the several methods which are included for specifying the composition of the concrete, namely, proportions by volume, by weight, by cement content, by water-cement ratio or by strength.

In addition to specifications referring to the concrete itself as delivered to the job, there has been interest in a further specification covering the method of operating the new types of equipment such as agitators and truck-mixers, which are now used in delivering the concrete; some agencies have desired to qualify the procedure for handling the materials prior to arrival at the job in the form of concrete. In response to this need the National Ready-Mixed Concrete Association recently published a summary of "Tentative Standards and Recommended Practices for Truck Mixers and Agitators of Revolving Drum Type." These provisions were drawn up by committees representing both the operators and the manufacturers of this type of equipment; it is intended that the provisions reflect the best current practice which will insure the delivery of high-quality concrete, but it is recognized that in a field which is undergoing constant improvement, any recommendations are subject to periodic revision as further study and experience may justify. These present tentative standards cover capacities, mixing speeds, mixing time, time of hauling and water measurement. By the application of these two specifications, either through reference in the general specification or by quotation of the pertinent portions of each, a specification writer can be assured that the concrete materials will be handled in a perfectly safe manner, and that the concrete arriving at the job will be a reliable product of the quality named in the specification.

Trend toward improvement

Ready-mixed concrete has made an important contribution toward better concrete practice, as the features of accuracy of measuring materials, assurance of thorough mixing and opportunity for complete control, have established standards of quality in concrete production which are far ahead of what was considered satisfactory performance in mixing concrete prior to a few years ago. This new method of furnishing mixed concrete to jobs from outside sources is now recognized as acceptable on practically all kinds of work.

But although the use of ready-mix in urban construction has increased steadily during the past decade, it is not to be anticipated that such operations will completely replace job-mixing, even in centers where efficient ready-mix services are operated. In industrial work where a railroad siding is available alongside the site, it is frequently possible to mix on the job at lower cost than ready-mix can be hauled in. Also on small jobs, especially if truck-delivery of aggregates direct from the source of production is available or if the builder is inclined to cut corners, a considerable amount of job mixing will likely continue.

But the fact is being recognized to an ever increasing extent, that ready-mixed concrete from an experienced and reliable commercial source, is more uniform and of generally better quality for a given specification, than can ordinarily be mixed on the job unless such job-mixing is surrounded with an accuracy and control comparable to the supervision behind the ready-mix operation, which is usually not feasible except on very large jobs. Supervisors and owners, as well as conscientious contractors, are coming to appreciate the intrinsic merit of ready-mix for quality construction. Factors of speed, convenience and general economy on the job, are also becoming recognized. Accordingly, a gradual further growth in the use of ready-mix wherever reliable service is now offered, and an extension of such operation to other points not now served but where the volume of construction will support the investment in plant and delivery equipment, it is to be anticipated. But ready-mixed concrete is primarily a quality product, and the future success of the industry will depend upon maintenance of the high character of operation which has brought such a complicated business in so short a time to the present degree of activity and acceptance.

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Beach Erosion Studies to be Made In Wave Tank

CONTINUED study by the Beach Erosion Board of the many problems caused by beach erosion will utilize a new and larger web tank, according to the Board's publication *Shore and Beach*. A new 27,000-gal. wave tank, now under construction at the Dalecarlia Filtration Reservation in the District of Columbia, is to be 85 ft. long, 12 ft. wide, and 4 ft. deep and will have built into it many new features that will make it the most flexible wave tank in this country.

In a beach erosion test in the new tank, miniature waves, created by a wave-making machine located at one end of the tank, will strike a model beach at the opposite end. Specially designed water inlets and outlets along both sides of the new tank will permit the creation of littoral currents at almost any desired angle, while a new automatically-operated gate located at the same end of the tank as the wave-making machine will produce the desired tide. The tide gate is to be operated by a float which will motivate a rod making and breaking contacts on a cam designed to follow a tide curve. An electrically-driven pump will operate at a constant rate in delivering water from the sump to the tank, while the elevation of the water is controlled by the tide gate.

Six windows at 10 ft. intervals along one side of the tank are to be used for observing and photographing various actions taking place inside the tank from below the water surface. A traveling platform, operating on rails set into the top of the tank's side walls, will permit observations and photography from above.

A "profilometer," developed by the board, is expected to receive its first use in the new tank. The meter, when attached to the traveling platform, will record the bottom profile.

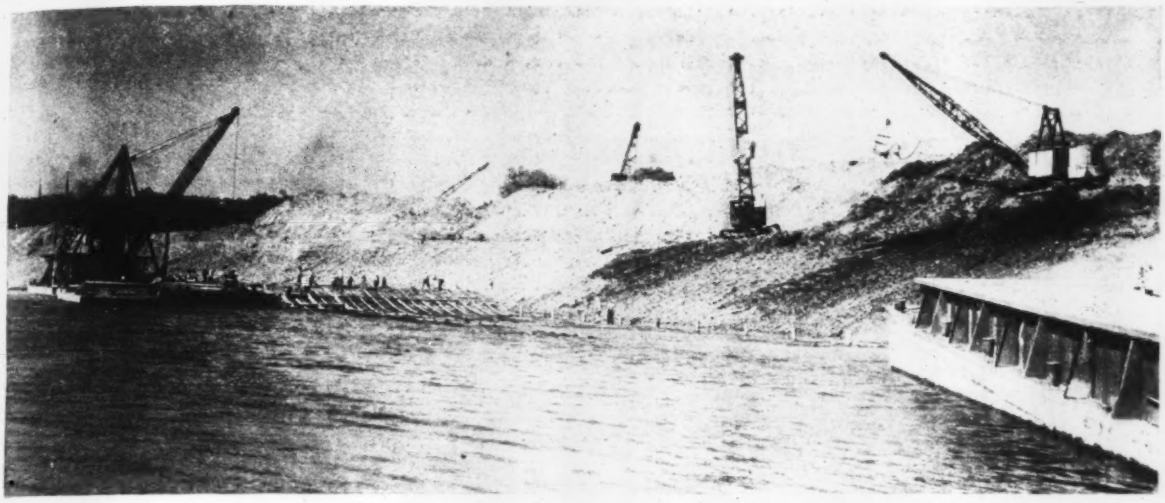

FIG. 1. A NEW MILE-LONG LEVEE PROVIDES EVANSVILLE BOTH FLOOD PROTECTION AND A PARKWAY PROMENADE

Evansville Transforms Its Riverfront

by L. A. Geupel

City Civil Engineer, Evansville, Ind.

Broad boulevard, boat harbor and landing, park and promenade reclaim unsightly and neglected waterfront area in Ohio River city

Through a major waterfront development, the city of Evansville, Ind., has transformed its long-neglected curving Ohio River shoreline from an eyesore and municipal disgrace into a beautiful and useful area. Formerly the non-industrial riverfront, extending from Court St. past the business district and through the residential area south to the municipal water plant, consisted of alluvial mudbanks, a disreputable stone-paved wharf broken up by washed-out roadways, a polluted slough and a park bank of broken brick and cinders. There was no fit and decent landing place for commercial or pleasure boats.

Reclaiming of the riverfront was urged by the City Planning Commission as far back as 1925, but it was not until 1936, when funds were made available by a PWA grant of $185,727 and a city bond issue of $325,000, that definite progress was made. Work started May 16, 1936, and the project was completed last December, just one month ahead of the record Ohio River flood. Though designed to afford protection against floods of the 1913 level, the project was deeply submerged in the January flood that rose 5 ft. higher than all previous record stages. Yet the newly-finished structures withstood their early baptism by flood with little damage.

The various features of the project include: a riverfront boulevard providing access to the business district and ample parking facilities; a concrete-paved wharf for the loading and unloading of transient river steamers, served by concrete roadways; reclamation of 15 acres of foul-smelling slough for park purposes; a new levee and promenade extending a mile along the shore, protected by riprap; and a recessed basin for pleasure boats. These improvements establish for the first time a definite and clear cut shoreline from Court St. to the water plant, and furthermore, open up possibilities of future business development that may rejuvenate a formerly busy waterfront.

The principal feature of the improvement is the construction of a retaining wall on the waterfront to permit the widening of Riverside Drive to a total width of 100 ft., of which 20 ft. is taken up by sidewalks on both sides, with 80 ft. remaining to provide ample parking facilities and safe traffic. The street pavement on Riverside Drive, which parallels the river improvement, consists of a 6-in. concrete base, reinforced with No. 3 gage mesh at 6-in. spacing and topped by a 2½-in. asphaltic-concrete surface.

The retaining wall is built on the site of an old stone-paved levee, and stands an average height of 13 ft. above the new concrete slope pavement. It is 1,585 ft. long. All except 125 ft. is of cantilever construction 13½ to 19 ft. high. The footing soil for the entire wall is river bank sand mixed with varying amounts of clay. Bearing tests on this sand showed a maximum of ⅜-in. settlement under a load of 3 tons for a 3-day period, 100 per cent above the actual load exerted by the toe of the wall. Therefore it was not considered necessary

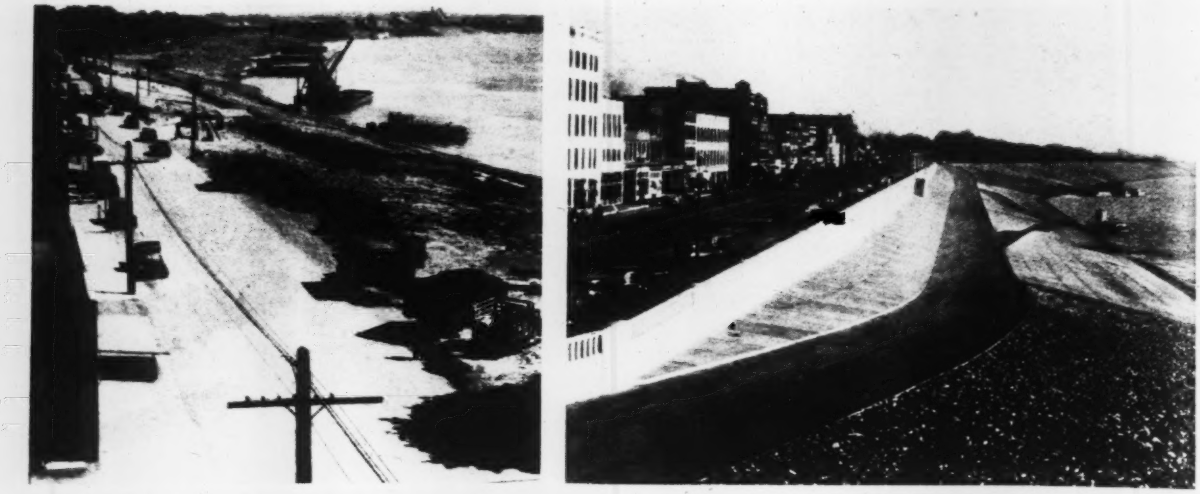

Fig. 2. Before and after the reclamation of the riverfront at Evansville, Ind., through extensive improvements. These two views were taken just six months apart from about the same point.

to place piling under any portion of the wall, except for a length of 60 ft. on a fill over the large Sycamore St. sewer outfall. Steel H-piles, 45 ft. long, were driven under this section, driven to carry a load of 40 tons.

Constructed on top of the retaining wall is an ornamental concrete railing or balustrade which includes modernistic banister posts that join the pilasters on the face of the wall. Shadows cast by the fluted pilasters and posts present a pleasing picture from the river and break the monotony of a plain wall construction.

A 30-ft. reinforced concrete drive curves around each end of the wall to lead traffic from Riverside Drive to a drive 22 ft. below. Riverward from this drive is a 430-ft. concrete loading wharf, located at the water's edge with 18-ft. drives tying it to the 30-ft. drive above. The loading wharf is 3 ft. above pool stage of the river and 14 ft. below the 30-ft. drive. A view from the river shows three distinct street levels with curving drives connecting all of them.

Substantial slope paving

That part of the levee slope below the wall which is not covered by roadway pavements is paved with a 5-in. concrete slab, reinforced with No. 12 gage steel mesh. Anchoring this slope paving are railroad rails driven into the levee 15 ft. on centers and secured to the steel mesh. The paving was constructed in 10-ft. squares with ½-in. expansion joints placed 20 ft. on centers.

To permit pedestrians to move from one street level to another a double stairway has been built at the center of the wall allowing easy movement to and from boat excursions or parked cars. Ornamental boulevard lights, rising 20 ft. above the street, line Riverside Drive on both sides and light the levee slope below. A visible river gage consisting of a bronze strip set in a 4-ft. wide concrete slab is laid on a 5:1 slope from the river's edge to the edge of Riverside Drive. Cut in the bronze are gage readings above zero and also the actual sea level elevations.

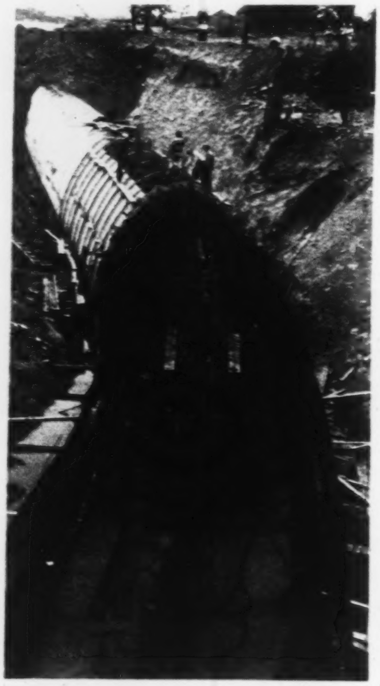

Fig. 3. A covered conduit now drains Bee Slough, formerly a stagnant, foul-smelling pool.

New levee paved with stone

Up river from the water front lies Sunset Park which extends from Riverside Drive to the river's edge. The bank along the park is graded to a 3:1 slope, the shoreline straightened and the bank paved with man-sized riprap stone. At the top of the bank, as a protection against floods, a levee is constructed which will protect the park and city against the highest flood stage recorded before 1937. Additional grading, seeding and planting is being carried on by the park department this year.

For protection against erosion of the river bank at a point where the current strikes, a woven timber mattress was constructed to reach 62 ft. into the river from the shore line. Ballast stone was placed on the mattress to sink it and insure against underwater erosion. At pool stage the depth of water is 9 ft. over the stream edge of the mattress. Wood piling, driven on the shoreline and cut off at the stone line, anchors the mattress against movement. The mattress extends from the waterworks bank revetment, which is the upper limit of the river work, downstream 1,600 ft.

Just downstream from the water plant a harbor has been built for anchoring small boats. Formerly the boats were anchored at privately controlled barges which were tied up at the shoreline and extended into the channel creating a menace to river traffic. The boat harbor is 900 ft. long and 175 ft. deep, cut into the bank in the form of a crescent. This location of the harbor was chosen because scouring action of the river current is expected to keep it free of deposits.

The bank of the boat harbor is also paved with riprap laid 10 in. deep. A hoisting house is constructed on top of the levee at the center of the harbor to raise and lower boats to and from the river. The hoist is connected to a special carriage running on a track which extends from a point 10 ft. below pool level to the top of the levee. At three points around the crescent of the harbor, concrete steps are built to the water's edge. Ways and means to provide for a floating wavebreak boom, boat docks, floating walkways and boat house have not been developed as finished and approved structures as yet but will be considered later.

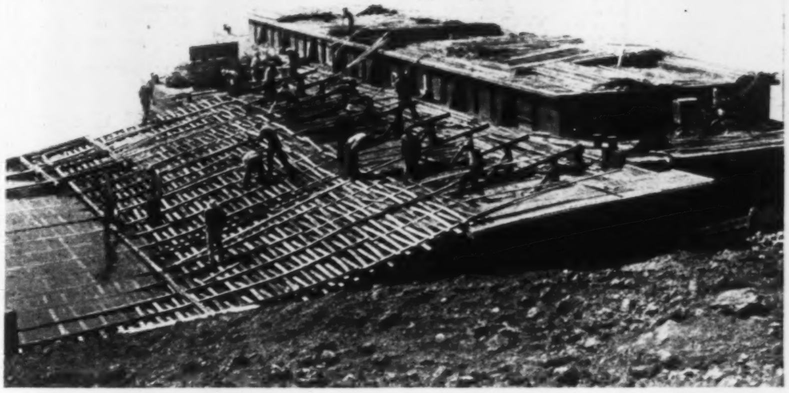

Fig. 4. The timber revetment mattress was woven in place from barges and sunk along the levee toe to prevent scour from eddy currents.

Storm water conduit

In the past a large drainage ditch called Bee Slough which carried both farmland and sewer runoff for a large area cut diagonally through the site of the present development along the river and was the source of foul odors at all times. A sanitary interceptor for dry-weather flow has been completed under another WPA Project, which has taken the sewage from the slough, but no provision was made for the storm water flow.

For the storm flow, a conduit of semi-elliptical cross-section 15.5 ft. high, 15.5 ft. wide and 965 ft. long has been built. Its outfall end joins with a headwall structure set on piles with walls sloped to conform with the levee slope. The upper end connects with a 15-ft. circular culvert under Adams Ave. and also receives a 60-in. storm-water relief sewer from the Adams Ave. sewer. This was constructed with inside collapsible forms which were mounted on truck carriages riding on temporary rail tracks. The sections were 10 ft. long and were moved forward in 50-ft. units.

The improvement project involved 22,600 bbl. of cement, 1,200,000 lb. of reinforcing steel, 95,000 lb. of structural steel, 18,000 sq. yd. of asphaltic concrete binder and surfacing, 270,000 cu. yd. of excavation and 17,000 cu. yd. of stone riprap. All concrete poured was delivered from two pre-mix concrete plants. Three derrick boats, at least eight heavy dirt-moving machines operating draglines, barges, numerous trucks, bulldozers and tractors were employed by the contractors.

The floods came

The structures of this project were built with the 1913 flood of 48.4 ft. in mind. In January of this year, 4 to 5 ft. of water covered the Riverside Ave. boulevards. At least 2½ ft. of water covered the balustrade.

Particular care had been taken during construction of the fill with the material placed behind the wall and on the slope paving. The slope paving fill could not be compacted by equipment. The fill on the roadway was made in water, the flooded condition being maintained by water jetting. The fill behind the wall was selected river sand which did not permit roller equipment for compacting. Heavy tractor equipment was kept moving over the fill after the flushing and jetting was stopped. The equipment could not operate immediately next to the wall due to the subfoundations for the light standards and drainage inlets which were built up from the footings. The main wall had expansion joints every 60 ft. but these joints were of the reservoir type with copper water breaks extending through the wall. At the top of the main-wall footings a gravel-packed open-jointed vitrified drainage line was laid with galvanized weeper pipes extending

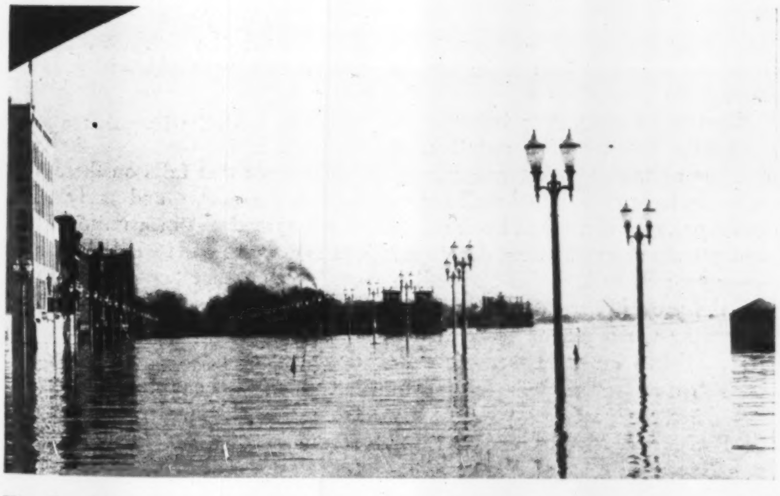

Fig. 5. Shortly after the project was completed the Ohio River moved in. The view shows Riverside Drive under 5 ft. of water.

through the wall and slope paving at 200-ft. intervals. The weeper lines were installed with check valves so that water could not come in from the river but it could flow out from behind the walls.

With 5 ft. of water over the new boulevard and top of the wall during the 1937 flood the major damage to the project was at the walks in front of the business buildings more than 90 ft. back from the river wall. Water rushing into coal chutes, areaways and utility holes left in basement walls washed the sand fill out from under the sidewalks permitting these walks and 300 ft. of integral curb to settle. At least six brick buildings collapsed and ten others were condemned, all of which were razed. The damage done to these structures was estimated at $200,000.

Mudjack raises slabs

Some settlement was noted in the sidewalk constructed next to the wall and in the boulevard next to the curb. The curb was tied by steel reinforcement to the concrete base of the boulevard pavement. The maximum settlement in one location was 3-in. and the average was 1-in. With the use of a mudjack the sidewalk and pavement have been raised to the former elevation at a cost of $1,200. The reinforced slope paving below the base of the wall extending to the 30-ft. roadway was raised with the mudjack and the work just completed in time to receive another river flood stage of 38.7 ft. on May 2. Sidewalks and curbs in front of the buildings cannot be repaired until the buildings are razed completely and the debris cleaned away. Damage caused by the flood to this part of the project is estimated at $5,000.

During the relief and rescue work of the flood period river boats and steel barges were tied next to the wall and moored to the railing. While everyone anticipated that whole sections of the railing of the balustrade would be demolished by steel barges smashing into the rail cornerwise only two places in the rail were found broken; repairs cost only $200.

The levee and riprap work were flooded on both sides, but other than a foot of natural settlement of a new green levee no major damage occurred. After the flood subsided, 1,000 cu. yd. of silt was hauled off the roadways and slope pavement. Except for the slab settlement, no movement of construction work was noticed. As the water receded the weepers discharged clear water and then suddenly stopped flowing.

Preliminary surveys were made and all plans were designed, laid out and completed by the city engineering department with no additional or outside assistance. The personnel of the engineering department includes L. A. Geupel, city civil engineer; C. E. Day, assistant city civil engineer. In charge of construction and layout were M. E. Boelson, resident engineer and John Kuster. The staff of Col. Van B. Wilkes at Louisville, Ky., was consulted on all river matters.

The $360,000 contract for the retaining wall, pavement for Riverside Drive and levee, river bank revetment was carried out by a combination of contracting firms, namely, the Western Construction Co., A. G. Ryan and Sons, and the Pioneer Contract Co., Inc. The contract for the construction of the Bee Slough conduit was awarded to the Northern States Improvement Co., St. Paul, Minn., for $94,207. The total cost of the project was $471,332. The city obtained a premium on the bonds for its 55 per cent share of the costs of the new project.

Forecasting Mountain Water Supply By Photographing Snowfall

by D. D. Gross

Chief Engineer, Board of Water Commissioners, Denver

Pictures of snow distribution are taken at regular intervals and correlated with runoff data from watershed

A large part of Denver's water supply is obtained from the melting snow along the Continental Divide of the Rocky Mountains. It has long been recognized by users of water from streams along the eastern slope of the Rocky Mountains that a bountiful supply of snow along the Divide in April means a bountiful supply of water and that a scant supply probably means a shortage. Late spring and summer precipitation has an important influence on the supply.

Demands for accurate information as to the amount of snowfall have become so insistent that government agencies have maintained staff gages, and more recently, aided by the state and private users of water, developed snow courses as a means of predicting the probable runoff. Information regarding the depth of snow at different points on watersheds is now published as part of weather reports.

During the past few years Harry L. Potts, water rights engineer for the Denver Board of Water Commissioners, has been developing what is to us an original method of forecasting runoff from the accumulated snowfall. At regular times during the year, but most frequently during the past winter and early spring, Mr. Potts has been taking pictures at the same spot on the Continental Divide, located near historic Hoosier Pass. Each of these pictures is identical as to location and takes in a panorama of many miles of the Continental Divide, including rugged mountain peaks, some of which are more than 14,000 ft. in elevation.

Snowdrifts in gulches

The snow that falls on these peaks during the winter and early spring is not spread out in a uniform layer but is driven by the wind into numerous gulches that traverse the mountain sides. After a heavy snow storm the mountains may appear one hundred per cent white for a few days but usually the snow soon disappears from the ridges, leaving only the accumulated drifts in the gulches. Since each spot of white on the photograph represents a bank of snow which has filled, or partially filled

Snow survey photograph at the headwaters of the South Platte River above Denver from which water runoff is estimated by comparison with pictures of the same area taken at other periods.

a gulch, it follows that the larger the area the deeper the snow.

After each picture is taken the percentage of the snow area is determined for comparison with other pictures. During the runoff season gaging stations are maintained as a means of checking the amount of water actually produced. Curves are platted from this information, to which is added a graph to show the amount of precipitation from rain during the late spring and summer. This information is being accumulated with the anticipation that in the future it will be possible, whenever a picture is taken and the percentage of snow area determined, to predict the amount of runoff from snow that safely can be counted upon. A forecast can be made in the early spring and the same method can be used to estimate the amount of moisture still remaining in the snow banks at any time during the summer.

Variations in runoff

The runoff does not always occur in the same sequence. The temperature affects the rate at which the snow is melted, thus with the same amount of snowfall the runoff during a warm spring and summer rises quickly to a higher peak and subsides early in the season, as compared with a season in which cooler weather prevails and runoff is extended over a longer period.

Evaporation plays an important part in the runoff from melting snow; for this and other reasons it is important to be able to make new forecasts from time to time as the season progresses. The method of taking pictures and estimating the area of snow storage is, we believe, the quickest method yet developed, and it makes possible the consideration of snow accumulated in places inaccessible by other methods. This method is especially useful in determining snow conditions above timberline. Most of the gaging points used in other methods are located at readily accessible points where it is anticipated that the snow will not drift. From these measurements snow conditions are predicted but a large part of the snow reserve is located in inaccessible places. At most of the places where snow gages are now located the snow disappears early in the season. The measurements of the snowfall, while accurately taken, are after all only indicative of what may be expected from the watershed as a whole.

Although these photographic investigations have extended over a comparatively short period of time, the results thus far have been gratifying.

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City Planning in Lansing

CITY GOVERNMENTS on the way out of the financial doldrums have a worthy model to follow in Lansing, Mich., according to the *Municipal Finance News Letter,* bulletin of the Municipal Finance Officers' Association. This Michigan city, an average community of 78,000, reports notable progress in managing its financial affairs.

All municipal salaries have been restored to pre-depression levels, some above. Wages for common labor have been raised from 62½ to 67½ cents an hour. Tax collections for the fiscal year just closed were better than during pre-depression years—just under 92 per cent. During the past year the city financed a $445,000 share of a PWA job from delinquent tax collections without borrowing. The city operated during the last fiscal year without short-term borrowing and has segregated cash on hand sufficient to meet all bond maturities to January 1, 1938.

Lansing's "utopian" state is due in part to the fact that a pay-as-you-go policy has been followed for five years. During this period the city gradually built up a reserve to offset delinquent taxes. No bonds have been issued since 1932 and the bonded debt of the city is being reduced about 12½ per cent each year.

Like a number of other cities, Lansing has recently installed accounting machines, and, according to City Comptroller R. E. Sanderson, these are a great help in keeping an accurate and up-to-date check on income and expenditures. A relatively small but interesting economy was effected in the city's burglary insurance. By installing a safe and money chest in the treasurer's vault, approximately five-sixths of the premium for burglary insurance is being saved, the economy representing the price of the new equipment every seven months. Lansing now requires bonding companies to furnish new bonds each year on city employees instead of renewal certificates as in the past. This gives greater protection, and the cost is exactly the same.

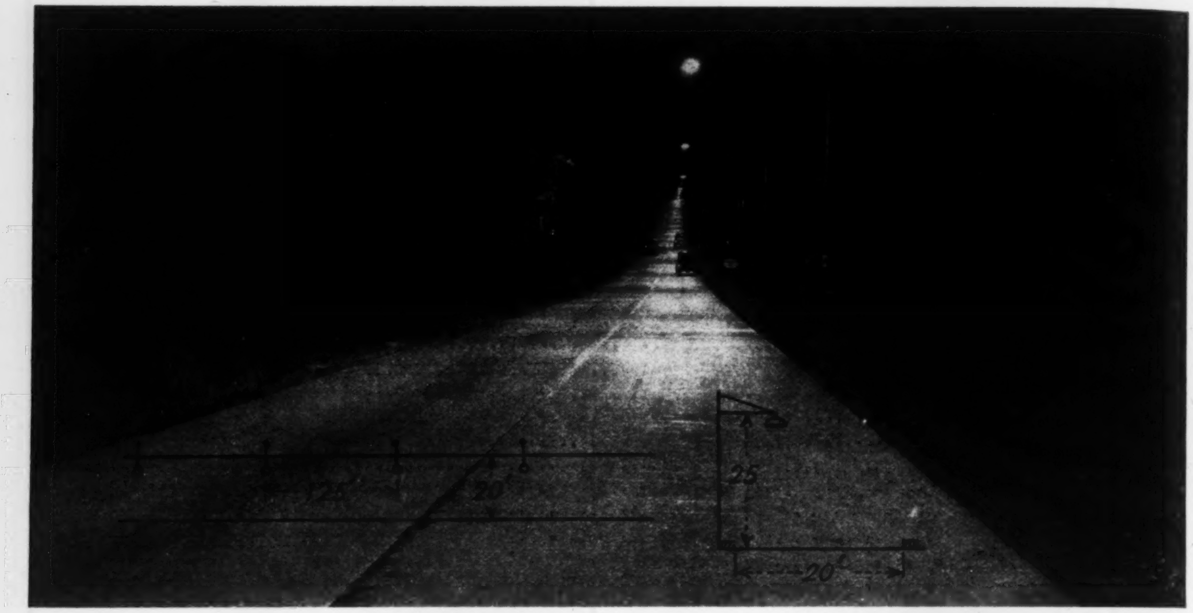

FIG. I. BALLTOWN ROAD NEAR SCHENECTADY, N. Y., TWO LANES WITH A SIMPLE ARRANGEMENT OF LIGHT UNITS

Roads That Have Been Lighted

by R. M. Swetland and T. W. Dana

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S. G. Hibben two weeks ago sketched where we stand today in highway lighting programs. In this article the lighting demonstrations that have been installed throughout the country are described

Opportunity to observe road lighting in operation has increased rapidly in the last three years. Lengths of lighted roads are now available for observation in nearly all sections of the United States. In general these trial installations are located where notable night hazards exist, at intersections and on city portal roads, but some are on main traffic routes of more rural character. Thus a reasonable range of study is practicable.

Most lighted stretches of road are only a mile or two long, but a few are much longer; one, near Schenectady, affords a score of miles of lighted night travel. The concentration of these roads naturally is still in the north Atlantic, north central and Pacific coast states. New installations are increasing the distribution every month, however, and most road engineers need not travel far to inspect a lighted road.

Types to be seen

The types of lighted road that may be observed can be broadly classified as straightaway two-lane paved roads, roads wider than two lanes, city entrance roads, traffic circles, long bridge roads and multiple intersections. The illustrations include an example of each type. In general each indicates the recommended type of installation for the conditions. Table II gives the condensed information for each road.

Balltown Road, near Schenectady, is one of the longer stretches of lighted two-lane concrete pavement. It represents a highway of normal two-lane construction and traffic, including some use by pedestrians. It is lighted, as shown by Fig. 1., above, with incandescent luminaires. These light sources were selected because they give particularly uniform pavement reflection and consequently good resulting visibility. A one-side location of the light units is adhered to; on curves this is always on the outside.

Schenectady-Albany Highway, a five-lane highway shown by Fig. 2 represents an admirable location for sodium luminaires with their broader distribution of light. The light units, spaced 130 ft. apart and 5 ft. over the pavement, are staggered to give illumination from both sides. They are connected directly to a 6.6 amp. overhead series circuit.

Pawling Ave., Troy, N. Y., offers

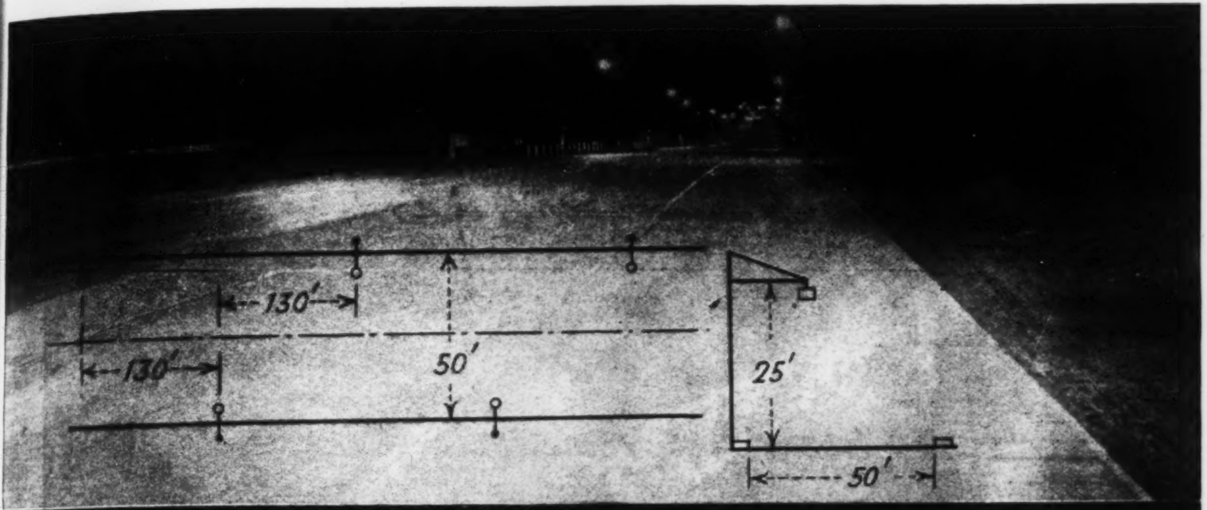
130'
130'
50'
25'
50'

Fig. 2. Wide multiple-lane lighting of the Albany-Schenectady road shows the location of light units on alternate sides.

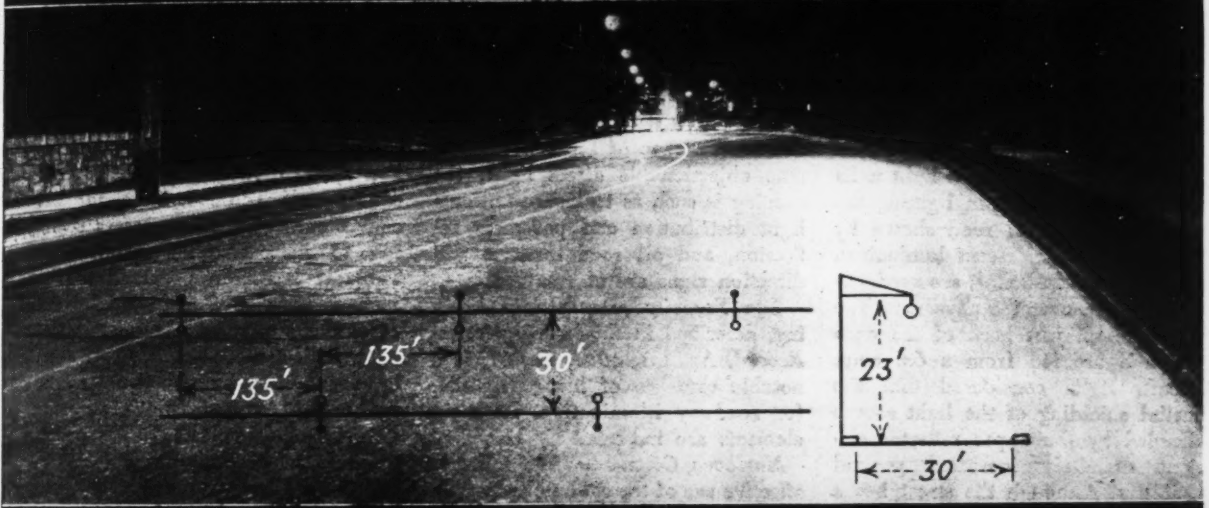
135'
135'
30'
23'
30'

Fig. 3. City entrance road to Troy, N. Y., illustrates again staggered light units on alternate sides of the road.

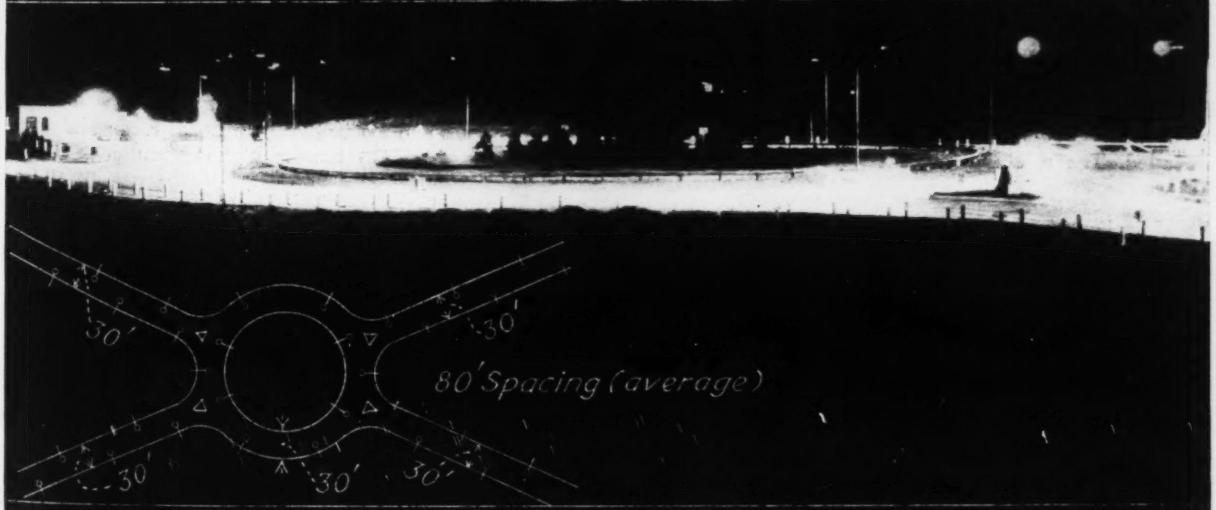
30'
30'
80' Spacing (average)
30'
30'
30'

Fig. 4. Traffic circle lighting is a special problem in each case; this illustration shows an installation near Troy, N. Y.

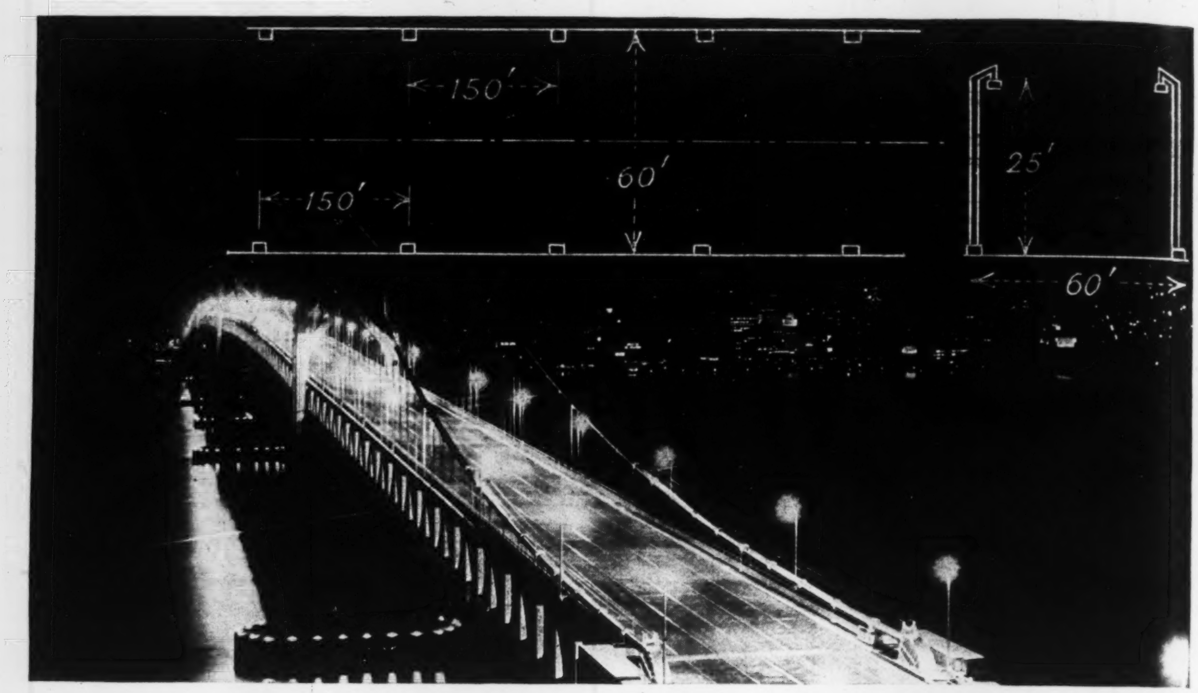

Fig. 5. Bridge lighting has for its most outstanding example the San Francisco-Oakland Bay crossing

an example of main urban entrance road lighting, Fig. 3. The light units are located about as in lighting the five-lane interurban road shown by Fig. 2, but incandescent luminaires, with 6000-lumen lamps, are used, extending 6 ft. over the pavement. The units are set just back of the curb line and are fed from a 6.6 amp. circuit. It is considered that the partial shielding of the light source afforded by the upper reflector element definitely increases general visibility. Although the street has a dark pavement, the resulting illumination of both roadway and sidewalks is very satisfactory.

Lathams Corners Traffic Circle, near Troy, presenting one of the most difficult lighting problems, is shown by Fig. 4. Here sodium luminaires with 6000-lumen lamps were installed. The shielding characteristics of this type of luminaire eliminate objectionable direct light; the spacing is such as to insure uniform light distribution and pavement reflection, and all road markers and direction signs are clearly visible.

San Francisco Bay Bridge lighting, described in *Engineering News-Record*, April 1, 1937, p. 467, is a notable example of bridge lighting for roadway illumination. Its main elements are indicated by Fig. 5.

Marlboro, Conn. Intersection makes effective use of the sodium lamp with its characteristic yellow color. A motorist approaching such a lighted intersection, Fig. 6, is attracted or warned of the impending danger by the caution color. This intersection is illuminated with 12 sodium luminaires with 10,000-lumen lamps, which give adequate illumination for seeing and reading signs.

For specific details of the six lighting systems illustrated the reader can consult Table I. Also for the convenience of road engineers desiring to inspect other installations Table II has been prepared to list such as have been equipped by the writers' company in 1936 and 1937.

As indicated by Mr. S. G. Hibben in the interview published two weeks ago (*EN-R*, Aug. 5, p. 217), these statistics show clearly that active progress in highway lighting is an event of the last two years. The tabulations are worth study for other reasons. In the half hundred installations only 18 of the 48 states are represented; in the 43 installations tabulated all but five on the most liberal count have sodium-vapor lamps, and the installations have been made: 14 by power companies, 7 by county highway authorities, 5

TABLE I — ELEMENTS OF THE SIX REPRESENTATIVE ROAD LIGHTING INSTALLATIONS ILLUSTRATED BY FIGS. 1 TO 6.

	Fig. 1 Typical 2-lane Hyw. Balltown Road	Fig. 2 Typical Super-Hyw. Albany Road	Fig. 3 Urban Traffic Artery, Pawling Ave., Troy, N. Y.	Fig. 4 Traffic Circle Latham's Cors. near Troy, N. Y.	Fig. 5 San Francisco-Oakland Bridge, California	Fig. 6 Typical Intersection Marlboro, Conn.
	Incandescent	**Sodium**	**Incandescent**	**Sodium**	**Sodium**	**Sodium**
Equipment	G.E. Form 86	G.E.-AM-2	G.E. Form 79R	G.E.-AM-3	G.E.-AM-4	AM-2
Lamp Size (lumens)	4,000	10,000	6,000	10,000	10,000	10,000
Linear Spacing — Ft.	125	130	135	80	150	80-140
Mounting Height — Ft.	25	25	23	25	25	23
Arrangement	one side*	staggered*	staggered*	staggered*	opposite	staggered*
Road Width — Ft.	20	50	30	30	60	20
Average Illumination — lumens/sq. ft. = f. c.	0.60	0.49	0.46	1.35	0.84	1.25-.75
Type of Support	Bracket on wood pole	Bracket on wood pole	Bracket on wood pole	Steel Standard	Steel Standard	Bracket on wood pole
Length of Installation—Mi.	5.6	1.1	2.5	Traffic Circle (31 units)	9.5	Intersection
Paid for by	County	County	City	State	State	State

* Luminaires located 3 to 5 ft. in over edge of pavement.

TABLE II — IMPORTANT HIGHWAY LIGHTING INSTALLATIONS INSTALLED DURING 1936 AND 1937 (G.E.)

Location	Miles or Units	Type and Size	Spacing in ft. and Arrangement	Road Type	Paid for by
1. Schenectady Bridge	1.0	Sodium 10,000 L	115-140 opposite	4 lane concrete	City
2. Schenectady, Balltown Road	5.6	Incandescent Form 86	125 one side	2 lane concrete	County
3. Schenectady, Duanesburg Road	17.5	Sodium 10,000 L	230 one side	2 lane concrete	County
4. Schenectady, Albany Road	0.7	Sodium 10,000 L	125 staggered	5 lane concrete	County
5. Tacoma, Wash	2.9	Sodium 10,000 L	?	4 lane concrete	State
6. Richmond, Va	0.8	Sodium 10,000 L	200 staggered	3 lane concrete	Power Co.
7. Binghamton, N. Y	4.1	Sodium 10,000 L	240 staggered	4 lane concrete	County
8. Middletown, Conn	1/2-1	Sodium 10,000 L	250 one side	50 ft. concrete	Power Co.
9. Skokie Highway, Chicago	0.9	Sodium 10,000 L	250 staggered	4 lane concrete	Power Co.
10. Rochester, N. Y	4 1/2	Sodium 10,000 L	230 one side	4 lane concrete	County
11. Akron, Ohio	1/2	Combination Sodium 10,000 L Incandescent Form 86	Sodium 230 Incandescent 125 one side	2 lane brick	Power Co. and City
12. Canton, O	1.0	Sodium 10,000 L	200 staggered	4 lane brick	Power Co.
13. San Francisco Bridge	925 Units	Sodium 10,000 L	150 opposite	6 concrete	City
14. San Francisco Bridge Approaches	35 Units	Incandescent 10,000 L	....		City
15. Dayton, O	1 1/2	Form 86 4,000 L	125 one side	2 lane brick	Power Co
16. Salt Lake County	3 1/3	Sodium 10,000 L	185 staggered	6 lane concrete	County
17. Bemidji, Minn	1.0	Incandescent Form 86	125 staggered	5 lane	?
18. Kerrville, Tex	....	Sodium 10,000 L	....	Bridge	State
19. Santa Barbara, Cal., 101 Highway	18 Units	Sodium 10,000 L	Intersections	....	State
20. Minneapolis, Minn	34 Units	Sodium 10,000 L	Intersections	....	State
21. Hannibal, Mo	1 1/4 (59)	Sodium 10,000 L	....	....	City
22. Corinth, Miss	1.0	Sodium 10,000 L	....	....	T.V.A.
23. Nashville, Tenn	1.0	Sodium 10,000 L	175 one side	3 lane	Power Co
24. East St. Louis, Ill	1.0	Sodium 10,000 L	....	....	Power Co.
25. St. Louis Express Highway	2.0	Sodium 10,000 L	165 staggered	5 lane	?
26. Marlboro, Conn	12 Units	Sodium 10,000 L	Intersections	....	State
27. Holyoke, Mass	2.0	Sodium 10,000 L	....	....	....
28. Wellington Bridge	24 Units	Sodium 10,000 L	....	....	State
29. 24 Intersections, New Jersey	300 Units	Incandescent 2,500-6,000 L	Intersections	....	State
30. Pickwick, Tenn	0.9	Sodium 10,000 L	250 one side	2 lane	T.V.A.
31. Saginaw, Mich	11	Form 86 4,000 L	134 staggered	4 lane asphalt	Power Co.
32. Sandusky, Ohio	1 (24)	Sodium 10,060 L	220 staggered	3 lane concrete	Power Co.
33. Youngstown, Ohio	1.0	Form 86 4,000 L	125 one side	3 lane	Power Co.
34. Akron, Ohio	1.0	Form 86 4,000 L	125 one side	24′	Power Co.
35. Cortland, N. Y	45 units	Form 79R 4,000 L	140 staggered	4 lane	County
36. Stuart, Iowa	0.5	Sodium 10,000 L	230 one side	2 lane	City
37. Greenwich, Conn	5	Sodium & 79R 10,000 L	230 one side	3 & 4 one side	Township
38. Michigan City, Ind	1.0	Sodium & 79R 10,000 L	245 staggered	4 lane	Power Co.
39. Valley Stream, L. I	100 Units	79R 4,000 L	100 staggered	5 lane	Township
40. Hornell, N. Y	0.5	79D 6,000 L	130 one side	25	Power Co.
41. Buffalo, N. Y	26 Units	Sodium 10,000 L	Railroad crossings	....	R.R.
42. Fort Dodge, Iowa	0.5	Sodium 10,000 L	....	....	Power Co.
43. Portland-Ore. Super-Highway	12 Units	Sodium 10,000 L	Dangerous Intersections	....	State

by cities, 8 by state highway departments, and the remainder by various owners. Assuming the units credited to power companies to be demonstration installations, about two-thirds of present (since 1935) lighted roads are purchased installations.

Admitting that all these thirty examples of road lighting are installed experimentally they still indicate that highway engineers have perceived the new problem ahead of them and are gathering the factors that go into its solution.

At the same time the research engineer has gone actively ahead in his study of light sources, lamp construction and principles of highway visibility. The determinations of these model road and field studies will be presented in the next article.

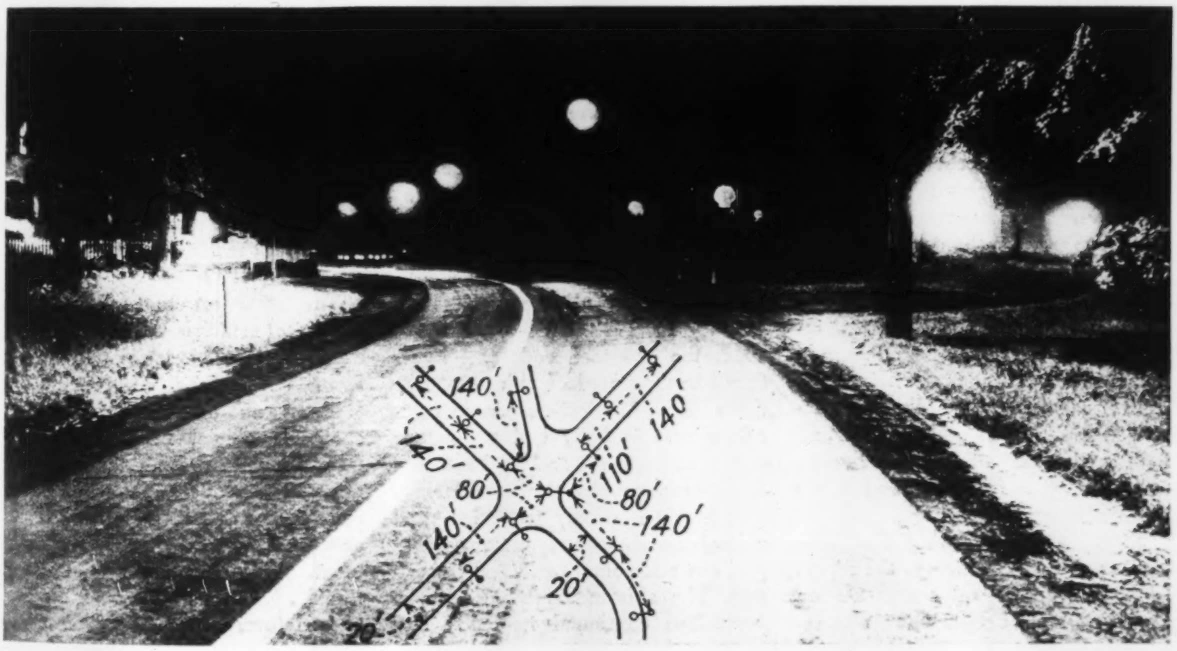

Fig. 6. Intersections like traffic circles are special problems in lighting; this is the arrangement at Marlboro, Conn.

New York's New Building Code

by George E. Strehan

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A comparison with the old code, a national model for two decades, and a critical analysis of the new regulations which go into effect next January

In 1928, the Merchants Association of New York City at the request of the mayor undertook the preparation of a new building code to replace Chap. 5 of the Code of Ordinances then and now governing the construction of all building structures in the City of New York. The old code, under reasonable interpretation by the administrative agencies set up for its enforcement, had been very successfully applied since its adoption in 1915, and still stands as a model document for safe building regulation and a credit to its framer, Rudolph P. Miller, for many years closely associated with building construction in New York City. However, for 15 years no progressive steps had been taken to maintain the code in line with developments in the art of building and changes in legislation provisions for the enforcement of the building laws. Modernization, therefore, was necessary.

History of new code

In pursuance of its commission, the Merchants Association set up a representative organization of building interests including 19 subcommittees to prepare the detail technical requirements. These technical committees were composed of some 125 individual members serving without remuneration, representing the practicing architectural and engineering professions and the building contractors in the city, as well as local and national insurance regulatory bodies, materials manufacturers and trade associations.

Early in 1930, during the functioning of this machinery, the report of the technical sub-committee on Iron and Steel Construction was introduced as an amendment to the old building code. The purpose of this amendment was to bring the provisions affecting this type of construction in line with similar laws adopted in various municipalities throughout the country in accordance with the recommendations of the American Institute of Steel Construction, and to secure economical advantages in the active skyscraper expansion then in progress in New York City. The amendment provided mainly for an increase in the permissible working stresses in the structural steel building frame, with a revision of the allowable working loads for various occupancies, and included protective provisions aiming to secure more intelligent and accurate design. This revision was recommended for approval, adopted by the board of aldermen and signed by the mayor on March 24, 1930. It has resulted in more economical use of structural steel and is incorporated, with detail provisions covering special steels, in the new code. Further reference will be made later in this article to the steel section of the new code.

The complete edition of the proposed building code recommended by the Merchants Association was printed in December, 1931, and was formally presented to the then mayor, James J. Walker, at a public assembly attended by all the framers on January 14, 1932. On November 22, 1932, the proposed code was introduced in the board of aldermen. For three years, the building code committee of that body had the matter under advisement, and in 1935 and 1936 conducted public hearings which were widely attended and evoked much discussion, several suggestions and some warranted opposition. The aldermanic building code committee continued its study and review of the recommendations in consultation with civic bodies and the administrative officials invested with the duty of enforcing the building laws. Finally on June 22, 1937, the proposed code in a revised form was reported out of committee with recommendations for its adoption by the board of aldermen.

This recommended draft of the code was printed July 9, 1937, and it is upon this imprint that the present review is based. The board of aldermen approved and adopted the new building code on July 20, 1937. The ordinance was signed by Mayor La Guardia on July 27, 1937.

Code accompanies new city charter

The code as adopted has been revised and amended to conform with state legislation establishing a new city charter for the City of New York, embodying an entire reorganization of the legislative and administrative branches of the government, including a city-wide building department in place of the now-existing five individual borough building departments, and abolishing the present reviewing body, the board of buildings. The new building code, together with the administration of the new city charter, becomes effective on Jan. 1, 1938.

The strongest and perhaps the most vital criticism that can be levied at this piece of legislation results from its method of preparation. Without an adequately-trained responsible official in charge of the work of collaborating the efforts of the 19 technical sub-committees, some strange peculiarities and inconsistencies have resulted in the document. As a corollary also, unintentional advantages have been credited to one form of construction or one class of materials over another. It is also to be noted that the adopted code contains changes and additions to the original draft made without resubmission to the technical committees, and without having been printed for information.

On the whole, however, the new building regulations are liberalizing in their effect, and, if properly administered, will foster safe construction: also because of resulting economies they should stimulate an unfortunately lagging building industry in the metropolitan area. Mayor La Guardia has stated that he considers the document an experiment and that he will insure immediate steps to eliminate any jokers or serious errors that may have been perpetrated in its formulation.

The new code is packed with revolutionary provisions in so far as the local building industry is concerned. It tends to fix the responsibility for safe design where it belongs, on the designing engineer. It directs the development of building construction along sound engineering principles. It predicates an efficient supervisory personnel in the building department of the immediate future. In brief, it is a long step in advance in the regulation of private and municipal building construction. But, in the writer's opinion, it is defective and weak in its provisions for supervision of construction, one of the important requirements of any code. The accompanying comparative analyses in tabular form of the old and the new codes show most of the fundamental detail differences.

Classification of structures

A fundamental and radical change from the old building code is the classification of structures on the basis of the fire resistance of materials and methods of construction as determined by time-temperature performance tests conducted under American Engineering Standards specifications. In place of the present three divisions, Fireproof, Ordinary and Frame, the new code establishes six separate classes of construction with distinctive fire retardent ratings, (Table 1). Also each type of construction is assigned specific limits of height and area dependent upon the estimated fire hazard of different occupancies and fire-retardent ratings of recognized materials and methods of construction, (Table 2). In this

TABLE 1—CLASSIFICATION OF BUILDINGS BY CONSTRUCTION

Old Code	New Code
Class 1. Fireproof. 4-hr. enclosure walls. 4-hr. floors and roofs.	**Class 1. Fireproof.** 4-hr. enclosure walls. 3-hr. floor and roofs.
Class 2. Non-Fireproof (Ordinary). 4-hr. enclosure walls. Wood joists or other combustible interior construction.	**Class 2. Fire-protected.** 3-hr. enclosure walls. 1½-hr. floor and roofs.
Class 3. Frame. Combustible construction, including all types not covered by Class 1 or Class 2.	**Class 3. Non-Fireproof.** 3-hr. enclosure walls. Interior combustible construction.
One Story Special-Metal Structures. No. 26-ga. sheet metal.	**Class 4. Wood Frame.** First Floor.—Columns and supports of incombustible construction. Balance.—Wood frame or other combustible construction.
Notes—Under new cose, fire-resistive rating is determined by time-temperature performance. The term "incombustible" is defined as a material which will not ignite or support composition in a surrounoing temperature exposure of 1,200 deg. for five minutes.	**Class 5. Metal Structures.** Structural framework and walls of metal or incombustible materials other than approved masonry.
	Class 6. Heavy Timber Construction. 3-hr. enclosure walls. Floors and roof of slow-burning or mill construction.

TABLE 2—RESTRICTIONS AS TO HEIGHT AND AREA

Old Code	New Code
Class 1. Unlimited (Fireproof). **Class 2. Non-Fireproof.**	**Class 1. Unlimited (Fireproof).** **Class 2. Fire-Protected.**
Hospitals, Jails, Places of Amusement.	
Height, 20 ft.	Not allowed.
All Other Public Buildings.	
Height 40 ft. .... Area 5,000 sq. ft.	Height 40 ft ...... Area 7,500 sq. ft. (1 street) 12,000 sq. ft. (2 streets) 15,000 sq. ft. (3 streets)
Commercial Buildings (Excl. Garages).	
Height 75 ft ..... Area 7,500 sq. ft. (1 street). 12,000 sq. ft. (2 streets) 15,000 sq. ft. (3 streets)	Height 75 ft. (6 stories) ... Area 7,500 sq. ft. 12,000 sq. ft. 15,000 sq. ft. Height 50 ft. (4 stories) .. Area, 10,000 sq. ft. 14,500 sq. ft. 17,500 sq. ft.
Garages.	
Height 50 ft. (4 stories). Note—Floors and columns protected with 1-hr. fire retardant.	Height 2 stories .... Area, 7,500 sq. ft. 12,000 sq. ft. 15,000 sq. ft.
Residence Buildings.	
Height 75 ft. .... Area 2,500 sq. ft.	Height 100 ft. (9 Stories) Area, 12,000 sq. ft. 15,000 sq. ft. 20,000 sq. ft.
Class 3. Frame. Garages .... 25 ft. x 5,0 sq. ft. Open Sheds .... 15 ft. x 2,500 sq. ft. All Other Buildings .... 40 ft. x 5,000 sq. ft.	**Class 3. Non-Fireproof.** Public Buildings .... 20 ft. x 5,000 sq. ft. Commercial Buildings .. 50 ft. x 7,500 sq. ft. 50 ft. x 12,000 sq. ft. 50 ft. x 15,000 sq. ft. 30 ft. x 10,000 sq. ft. 30 ft. x 14,000 sq. ft. 30 ft. x 17,500 sq. ft. Garages (1 story) .... 30 ft. x 7,000 sq. ft. 30 ft. x 12,000 sq. ft. 30 ft. x 15,000 sq. ft. Residence Buildings .... 75 ft. x 3,000 sq. ft.
Class 4. None.	**Class 4. Wood Frame.** Public Buildings (except places of assembly) 1 story x 600 sq. ft. Garages .... 1 story x 600 sq. ft. One-Family Residence ...... 40 ft. x 2,500 sq. ft. Multi-Family Residence ..... 35 ft. x 2,500 sq. ft.
Class 5. (Special). 15 ft. x 1,250 sq. ft.	**Class 5. Metal Structures.** Commercial and Industrial . 30 ft. x 15,000 sq. ft. Garages .... 20 ft. x 5,000 sq. ft.
Class 6. Note.—Same as Class 2.	**Class 6.** Churches .... 40 ft. x 6,000 sq. ft. (1 story) 40 ft. x 8,000 sq. ft. (2 or 3 stories) Hospitals and Places of Assembly 20 ft. x 6,000 sq. ft. Public Buildings (other than churches, hospitals or places of assembly) 35 ft. x 6,000 sq. ft. 35 ft. x 8,000 sq. ft. Commercial Buildings 65 ft. (5 stories) x 7,500 sq. ft. 65 ft. (5 stories) x 12,000 sq. ft. 65 ft. (5 stories) x 15,000 sq. ft. 40 ft. (3 stories) x 10,000 sq. ft. 40 ft. (3 stories) x 14,500 sq. ft. 40 ft. (3 stories) x 17,500 sq. ft. Garages .... 1 story x 10,000 sq. ft. 1 story x 15,000 sq. ft. 1 story x 18,000 sq. ft. Residence Buildings .... 75 ft. x 3,000 sq. ft.

scale, the "Fire-protected" structure with 3 hr. inclosure walls and 1½-hr. interior construction is permitted in residence buildings up to a height of 9 stories and not exceeding 90 ft. This less rigid specification is distinguished from the present full 4-hr. requirements for all fireproof buildings.

Again, the old type of heavy mill or slow-burning construction with 3-hr. inclosure walls is granted advantages over the present "Ordinary" construction of brick wall inclosures with wall-bearing wood-joist floors. No special recognition was granted to heavy mill construction in the old code.

Another departure from the requirements of the old code is the more definite recognition of the all-metal structure constructed entirely of incombustible materials, which is permitted, within the fire limits, for commercial occupancies, to a maximum area of 15,000 sq. ft. and 1-story in height.

The basic requirements for the so-called full "Fireproof" structure have been decreased somewhat in severity. Inclosure and fire walls are still maintained at 4-hr. requirements, but interior construction has been reduced to floor assemblies of 3-hr. rating. In addition, a whole chapter of the code has been devoted to a comprehensive treatment of the details of classification and testing materials and methods of construction and establishing definite test specifications for each specific element of the structure, to determine its fire-resistive rating and permissible use. These specifications are generally consistent with the state of the art and the standards established by recognized authorities. As heretofore, structures of reinforced concrete, complying with the design requirements of the building code, are recognized as full fireproof construction.

Advances in residence structures

Definite progress is shown in the establishment of test requirements for the fire-resistive rating of fire doors, shutters and windows and in the recognition of the smoke hazard as well as the heat and flame menace in buildings designed for human occupancy. An attempt is made to establish the test requirements on a more practical basis consistent with the facts than is the case in the old code specifications for opening protectives. Under the new rules fireproofed wood doors, constructed of wood impregnated with fire-resisting chemicals, will be acceptable as opening protectives under certain restrictions, supporting the action of the present administrative officials in modifying the test requirements for fire door assemblies in the provisions of the old code.

"Fire limits" extended

In step with the growth of New York City, the "fire limits," within which frame construction is prohibited, have been extended to cover practically all of the boroughs except outlying exclusively residential districts. As the zoning of undeveloped outlying districts for permissible use, height and area progresses, the fire limits will automatically be extended to conform with actual occupancy of the land. These provisions will tend to reduce the erection of combustible construction within the city limits.

At the same time, the specified requirements for wood-frame construction have been strengthened, including fire-stopping at floor levels and definite fire-resistive tests for roof coverings; this should function to reduce the rapid spread of conflagrations.

Egress requirements

Egress requirements of the new code are founded on the same basic principles as the old regulations which have borne the test of successful application for a period of years. Certain liberalizing provisions have been introduced to apply to limiting cases for which variations of the law have been found desirable in the past. In the case of special-occupancy structures, such as theatres and places of public amusement, the provisions have been made more flexible without sacrificing necessary elements of safety. In addition to the present practice of posting allowable live loads in industrial buildings, the new code requires that the authorized human occupancy be posted in the main entrance lobby of each structure. A further requirement for public health in every building designed for human occupancy, specifies a ventilation index, determining a definite quantity of fresh air supply per cu. ft. per min., per sq. ft. of floor area.

Materials, stresses and loads

Next in importance to the regulation of construction on the basis of time-temperature performance is the attempt to bring the provisions covering building materials, methods of construction, required working loads and permissible stresses, (Tables 3 to 7), into closer conformity with actual use requirements and modern improvements in materials manufacture. It is also important to note that the ancient anomaly of "factor of safety" has been abandoned. No longer is there a reference to 1:4 for steel, 1:6 for timber and 1:10 for masonry; with one unfortunate exception, namely the partial recognition of concrete brick as a solid concrete unit in masonry construction limited to a working stress of 1/10 of the ultimate strength of the unit when laid in cement mortar and 1/12 when laid in cement-lime mortar. Opportunity to offset this requirement is found in the test for new masonry materials, in which the allowable working stress is designated as 30 per cent of the ultimate strength of full-size test panels 9 ft. high. There are now on the market acceptable and approved types of sand-lime as well as concrete bricks for which more definite provision should be made in the building laws, particularly as A.S.T.M. specifications and the old building regulations recognize these materials.

Some criticism may be warranted of the increased stresses for brick masonry when applied to the type of material and workmanship encountered in every-day building practice. Strength efficiency of clay brick masonry varies all the way from 20 to 40 per cent of the strength of the unit up to as high as 80 per cent for concrete brick masonry. Ultimate compressive strengths of actual masonry in the field have been dedetermined by test as low as 800 to 1200 lb. per sq. in. The propriety, therefore, of 325 and 500 lb. per sq. in. working stresses (Table 3) might well be questioned and, in the writer's opinion, such stresses are not warranted and may be dangerous.

TABLE 3—MASONRY WORKING STRESSES
Lb. Per Sq. In.

Material	Old	New
Ashlar masonry (cement mortar)	600	800-500
Sandstone ashlar	300	300
Brickwork (Portland cement mortar)	250	325-500
Brickwork (lime and cement mortar)	160	250-400
Brickwork (lime mortar)	110	100
Concrete block (cells vertical)	75	70
Concrete block (cells horizontal)	30	..
Terra cotta block (cells vertical)	100	125
Terra cotta block (cells horizontal)	50	70
Portland cement concrete:*		
(a) Mass concrete masonry	1 : 2½ : 5 Mix	1 : 7 Mix
Ultimate compressive strength	..	1,500
Direct compression	400	400
(b) Fireproofing (stone or cinder)	1 : 2 : 5 Mix	1 : 2 : 5 Mix
Ultimate compressive strength	..	Stone 1,750 Cinder 700
Direct compression	Stone 500 Cinder 300	Stone 400 Cinder 200

*In New Code, water-cement ratio is controlled for all mixes. Distinction is also made between Grade I and Grade II fireproofing, depending on character of aggregate.

TABLE 4—TIMBER WORKING STRESSES
Lb. Per Sq. In.

Species	Flexure		Compression With Grain		Horizontal Shear	
	Old	New	Old	New	Old	New
Yellow pine, merchantable	1,600	1,600	1,600	1,200	150	125
Douglas fir, No. 1 common	1,200	1,200	1,200	1,100	100	125
Oak	1,200	1,200	1,400	1,000	200	100
Spruce	800	1,050	800	720	100	60
Hemlock	1,200	1,000	1,200	720	100	70

TABLE 5—STRUCTURAL STEEL WORKING STRESSES
1000 Lb. Per Sq. In.

Material	Flange Stress*		Shear		Bearing		Column Stress $l/r=60$		Column Stress $l/r=90$		Column Stress $l/b=120$	
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Rolled steel	16	18	10	12	24	30	11.8	15	9.7	12.4	7.6	10
Rolled steel (concrete haunches)	16	20	..	..	..	..	..	..	..	..	..	..
Rivets (power driven)	..	..	12	13.5	24	24 30	..	..	..	..	..	..
Bolts (unfinished)	..	..	7	16	12	16 20	..	..	..	..	..	..
Special Steels	30% of ultimate strength in tension (other stresses proportionate)											

*Note—l/b ratio is 15 under New Code compared to 20 under Old Code.

TABLE 6—REINFORCING STEEL WORKING STRESSES
Lb. Per Sq. In.

Material	Tension		Compression	
	Old	New	Old	New
Bars, structural grade	16,000	18,000	7,500	7,500
Bars, intermediate grade	16,000	20,000	7,500	7,500
Bars, rail steel	16,000	20,000	7,500	7,500
Web reinforcement	16,000	15,000	..	..
Cold-drawn mesh	20,000	20,000		..
Cold-twisted twin bars, structural grade	..	27,000		..
Cold-twisted twin bars, intermediate grade	..	30,000	..	..

TABLE 7—REINFORCED CONCRETE WORKING STRESSES
Lb. Per Sq. In.

Type of Concrete	Mix		Comp. Strength f'c		Fiber Stress		Direct Comp.		Ratio "n"		Shear	
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Aver. "A"	1:2:4	1:5½	2,000	1,750	650	650	500	500	15	15	40	40
Aver. "B"	1:1½:3	1:4½	.....	2,250	650	800	600	625	12	12	40	50
Controlled	Determined by preliminary tests				..	0.4f'c	...	0.25f'c	...	30,000f'c	..	0.02f'c

Other working stress provisions in the new code fix the estimated spread between working loads and ultimate strength, such as a working tension of 30 per cent of the ultimate tensile strength for special steels, the requirement that open-web steel joist construction shall support without failure two and one-quarter times the total design load, and the specified working stresses of 25 per cent of the ultimate strength of concrete in compression and 40 per cent in bending.

In general, the new code is based on a more intelligent application of present-day materials and improvement in methods and quality of manufacture and contruction. The specifications for quality of materials are based on the standards of the American Society for Testing Materials and, in general, make adequate provision for new materials and methods of construction by establishing specific performance requirements on the basis of standard tests.

Live load requirements

Live load requirements have been revised from the old code specifications, in some cases reduced and in others increased, but generally changed in accordance with the recommendations of the building code committee of the National Bureau of Standards. The proposed load requirements appear to be reasonable and conservative.

The specified treatment of wind loads and stresses is more definite and positive than in the old code and is in line with experience developed in the West Indian hurricanes of recent years as well as with experimental laboratory determinations.

Methods of design

While the new requirements are more detailed and more exacting in the specification of quality of materials, permissible working stresses have generally been increased, accompanied by more specific and rigid requirements of design. In structural steel frames, the use of continuous beams and girders is permitted when designed in accordance with accepted engineering principles, and full provision is required for eccentric loading in connection details and for combined bending and direct stress in columns. The code specifies that the design of reinforced concrete members shall be based on the generally accepted theory of flexure for continuous beams and rigid frames, and the structural members must be proportioned for those combinations of loading that will cause the maximum stress conditions, rather than for a uniformly distributed load over the whole structure. In lieu of rational design based on the elastic theory of structures, exceptions are made permitting the use of specified bending moment coefficients under certain restrictions and limitations of span length and live-load ratios.

Timber construction

The design of timber frames is based on the use of actual rather than nominal sizes in accordance with the government simplified practice recommendations. All lumber and timber for structural purposes must bear the trade mark and grade mark of the lumber association rules under which the particular species is graded. This is a step far in advance of present practice but in line with rational procedure. Specific stresses are specified for the ordinary lumber grades used in the locality (Table 4) but discretionary power is granted to the superintendent of buildings to permit higher working stresses on grade-marked timber of higher structural grades based on authoritative test data.

Steel construction

The allowable working stresses on steel construction have been generally maintained as provided in the amendment of the old code adopted in 1930 (Table 5); except that detailed provision is made for the use of nickel and special high test steels when inspected and tested by a recognized inspection bureau. If safeguarded by accurate and careful methods of design, as predicated in the new law, with full provision for eccentric loading and allowance for secondary stresses due to connections, no exception can logically be made to these provisions. The increase from the 16,000 to the 18,000 lb. bending stress is fully warranted as well as the use of a 20,000 lb. stress in structural steel members encased in concrete. With careful design, the approximately 25 per cent increase in structural steel column loads is, perhaps, also safe. However, tests have shown that in light building construction designed under the commercial practices that prevail in ordinary private construction, there is very little if any spread between ultimate strength and working loads. Failures have occurred, which can be at least partially traced to this cause. Tests showing an actual factor of 1½ or even less on the yield point or useful limit of the material are not entirely rare on test specimens carefully prepared and centrally loaded. Moreover, open hearth or bessemer steels of structural grade, within the permissible A.S.T.M. limits of chemical composition, show yield points as low as 26,000 and 28,000 lb. per sq. in. in place of the usually assumed 36,000 lb. per sq. in. This criticism might not apply to the carefully designed and supervised engineering structure erected under careful engineering control. If the new practice is to prevail with a reasonable degree of safety, the requirements should be strengthened by requiring supervision of a professional engineer over both shop and field work.

TABLE 8—COMPARISON OF PERMISSIBLE LIVE LOADS — Lb. Per Sq. Ft.

Character of Occupancy	Live Loads Old	Live Loads New
Residence	40	40
Offices	60	50
Schools	75	60
Theatres	100	75
Lobbies and places of assembly	100	100
Stores (retail)	120	75
Factories	120	120
Stables	120	75
Garages (pleasure cars)	120	75
Garages (trucks)	120	175
Trucking spaces	150	300

Welded structures

The process of fusion welding in assembling structural steel frames, which is permitted by the new code, has developed rapidly in the last decade and is now recognized as sound practice when executed by competent workmen under competent supervision. In addition it possesses the advantage of producing what is in effect a monolithic structure together with the attendant disadvantages incident to expansion and contraction accompanied by elastic deformations of the structure frequently experienced in the reinforced concrete frame. In the absence of any definite test for checking the strength of field connections, the only safe procedure in welded structures is to require supervision of erection by competent engineering control. This the new code does not provide, but instead leaves this necessary safeguard to be taken care of by rules to be formulated by the Board of Standards and Appeals.

Reinforced concrete

The new code permits the use of improved methods of design and construction of reinforced concrete when controlled under specified and detailed safeguards, with corresponding allowances in increased working stresses and reduction in size of members. In liberalizing the use of this material under methods of control which have been safely applied for the last decade in many structures, the code does not change existing practice in regard to the use of "average" concrete designed and placed without special supervision and without methods of control, except to make the requirements for strength and for check supervision more rigid than did the old code. The permissible stresses on uncontrolled concrete have not been increased. On the other hand, the allowable working loads on columns have been reduced below present New York practice, and the design requirements have been made more specific and more rigid.

Administration

The new building code follows in general the administrative provisions of the old code except that its enforcement will be in the hands of one body, a Department of Housing and Building, which will also administer the Multiple Dwelling Law, the Labor Law and the Zoning Resolutions. The code recognizes, as did the old code, the assignment of power to the Board of Standards and Appeals to make rules and regulations respecting the approval of materials, methods of construction, and interpretation. However, contrary to the new city charter, it apparently also endows the superintendent of buildings with the power to approve new materials under the rules and regulations promulgated by the Board.

The new code further provides that the applications for all building permits must be made by the owner, an authorized registered architect or an authorized licensed professional engineer, whereas the state education laws, governing the practice of licensed architects and engineers, make this provision apply only when the proposed building operation exceeds a cost of $10,000 or involves a structure of more than 30,000 cu. ft. Further safeguards in the administrative provisions involve affidavits by registered plumbers and licensed electrical workers covering electric work in conjunction with fire alarm signal systems and sprinkler and standpipe installations.

Structural affidavits

Two additional affidavits are required in connection with all applications for permits. Where structural work is involved affecting public health and safety, an affidavit of a licensed architect or professional engineer must be filed certifying that he has supervised the preparation of the plans and that the structure, if built in accordance therewith, will conform with the provisions of law governing such construction. Furthermore, each application for a certificate of occupancy, after completion of the operation, must be accompanied by an affidavit, either of a registered architect, a licensed engineer, or the superintendent of construction, stating that he has examined the plans and specifications and that the structure, to the best of his knowledge and belief, has been erected as designed, and that it complies with the law.

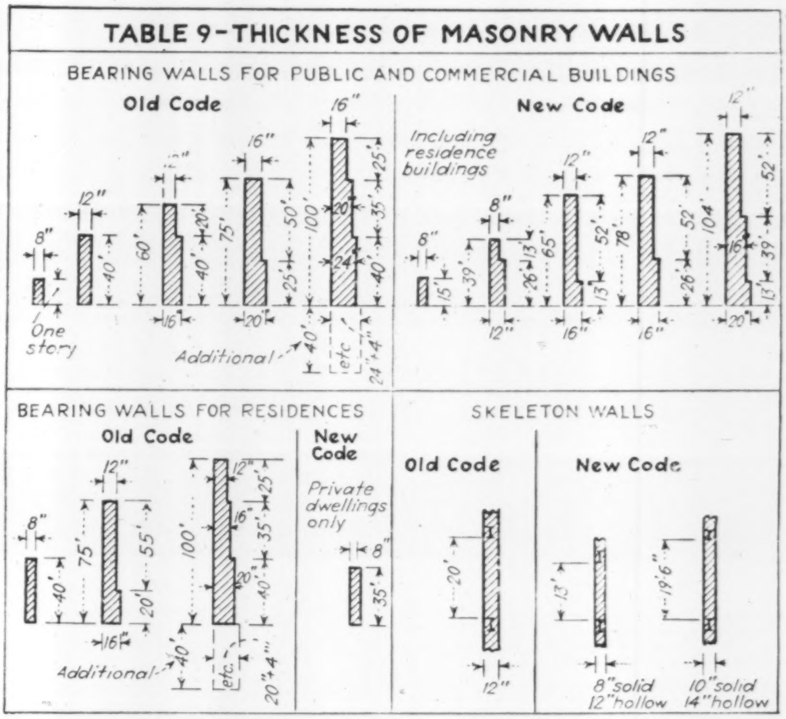
The weakness of this provision is evident. In fact in no instance, other than that of a structure designed and constructed of "controlled" concrete, is it required that the erection shall be *supervised* by the architect or engineer responsible for design.

In the case of welded structures the code provides that the architect or engineer designing or supervising the construction shall be experienced and skilled in such work. Also that fusion welding is to be done only under rigid inspection and specification in accordance with rules to be promulgated by the Board of Standards and Appeals. The law further provides for a certificate of fitness to be issued by an examining board for welders to each welder employed on the job but makes no specific provision for the establishment of such board or for the required supervision of the work by a competent engineer. Another provision requires contractors desiring to do gas cutting of steel to satisfy the superintendent of buildings as to their ability.

Many minor defects have unintentionally been injected into the new code by reason of the method pursued in its preparation and promulgation. Requirements which should apply commonly to various types of construction have been drafted to affect only one. An outstanding example of this inconsistency is the differentiation between the presumptive capacities of rock foundations under deep concrete piers and steel grillages located directly on the rock. In the latter case, the pressure is limited to 40 tons per sq. ft. whereas in the former case the rock may be loaded to 72 tons per sq. ft.

Several provisions which occurred in earlier drafts have been omitted from the text printed July 9, 1937, and adopted by the Board of Aldermen on July 20, 1937. Examples of such omissions are the important provision for reduction in shearing stress on the webs of deep, unstiffened plate girders, and the provision for increased soil pressures with increase in depth of foundations. Many other undoubtedly unintentional errors have crept into the code such as the limitation of cement used in reinforced concrete construction to high-test cement by a misquotation of A.S.T.M. standard specifications and the inclusion of increased working stresses for a special patented type of concrete bar reinforcement.

TABLE 9—THICKNESS OF MASONRY WALLS



Too much detail

The new building code by virtue of the voluminous detail requirements governing methods of design and testing is, in the writer's opinion, unnecessarily inflexible for satisfactory administration. Much of the advantage of the liberalization of technical requirements is offset by this inflexibility. The proposals of the original technical sub-committees were subdivided into two classes of regulation, one comprising the building law proper consisting of basic administrative and structural requirements, and the other comprising supplemental regulations and rules interpreting and augmenting the provisions of the law and subject to revisions by the Board of Standards and Appeals. As now formulated, the code may make the work of the practicing engineer and architect unnecessarily difficult and impractical.

Detail requirements for plumbing and sanitary installations, automatic sprinkler systems (fire alarm signals and fuel oil systems were not included), elevator and standpipe equipment, which heretofore have been regulated by rules of the Board of Standards and Appeals, would best not be included in the code proper. Improvements and changes in the practices and details of these arts are numerous. The incorporation of such requirements in the code will necessitate frequent action by the legislative rather than the administrative agencies of the city government.

In the experience of one who served as a member of a technical subcommittee, it is evident that a more logical and certainly a less costly revision of the building code would have resulted from a progressive revision, article by article, of the present law, under the guidance of a competent technical adviser aided if necessary by a small technical staff. The time factor would have been less and the final results would have more nearly expressed the most modern requirements.

Improving Waterworks Management

by E. Grosvenor Plowman
Denver, Colo.

An outline of sound administrative practice in guiding personnel relations, purchasing, engineering, customer service and plant operation

Weaknesses in water utility management and a discussion of the relationship between proper organization and good management, based on actual field studies in a number of cities, comprised the substance of two previous articles (*ENR*, Aug. 5., Aug. 12). In the following an attempt is made to review from numerous examples available, some of the best operating practices of municipal water utilities. General suggestions relating to improvement in organization and management practice are also included.

It should be noted at the outset that from the standpoint of administrative efficiency private water utilities rank first. Consistently excellent operation is one of the fundamental reasons why the privately-owned Indianapolis Water Co., for example, can maintain remarkable earning power under reasonable rates. The Hackensack (N. J.) Water Co. is another example of private management of excellent character.

Ranking second in efficiency are publicly-owned water utilities administered by independent boards. Some publicly-owned utilities, such as the East Bay Municipal Utility District in Oakland and vicinity and the properties under the Erie and Des Moines board of water commissioners, are equal to the best in private practice. The average even of this independent-authority class, however, is somewhat below private practice, chiefly because of the slowing down of operating progress under conditions of public ownership.

Far below these levels of efficiency are the average municipal water utilities, many of which can and do boast that they have made no substantial change in operating practice for ten or twenty years. Of course there is no such thing as any one water utility achieving operating perfection and the best that can be hoped for is a high average. There must be some turnover in the assembly of operating systems. Some particular system or procedure becomes obsolete and is replaced with a better plan this year, another next year. To stop this turnover is to stagnate.

Departmental organization

The basis of efficient operation is sound departmental organization. Departmentalization is not sacred, however, and should not be permitted to act as the dead hand of the past retarding progress. Nor is departmentalization something casual, to be pulled apart and hauled around by politicians and ambitious employees. It is a problem in common sense.

Sound organization of the municipal water utility must recognize and provide for the interrelation of eleven major functions. Those functions concerned with major construction, legal advice and litigation, handling and safe-keeping of money, auditing, and civil service, are coordinate with but independent of the water utility manager; under the top executive must come the functions of personnel administration, purchasing, engineering, minor construction, customer service, and operation.

The elements of a sound system of personnel administration, as developed in the East Bay municipal water utility seem to be as follows: (1) Maintenance of an accurate record of each employee throughout his entire career with the utility; (2) hiring and firing for efficiency reasons only, providing maximum possible security of employment and guarding against accidents as aggressively as do the best private businesses; and (3) through an employees organization developing mutual benefit and credit union services, stimulating morale and carrying on informal collective bargaining.

The elements of a sound system of purchasing, as developed in the same utility are as follows: (1) Purchasing exactly what is needed, from the lowest-priced responsible source of supply, having regard for the social desirability of spreading municipal purchases throughout the community; (2) purchasing only on exact specification and testing all deliveries, always insisting on compliance; (3) where water utilities shops can furnish comparable products, the placing of orders with them, but only to the extent necessary to provide reasonably full employment for shop workers.

Elements of efficiency

For a sound system of engineering and minor construction, the following elements developed in the Baltimore municipal water utility, are exemplary: (1) Working out of a comprehensive master plan of water development for the entire metropolitan area, including all suburbs capable of advantageous interconnection; (2) carrying on all minor construction in accordance with this master plan, including suburban construction; and (3) budgeting and undertaking minor construction at a rate sufficient to offset depreciation and to improve the plant, without forcing a resort to expensive emergency measures or major construction projects merely to wipe out deficits.

A sound system for customer service, as developed in the Denver municipal water utility includes the following elements: (1) Creation and maintenance of an absolutely accurate tap record; (2) use to the maximum practical extent of punched card billing and accounting to minimize human errors, to increase speed, and to lower costs; (3) centralized handling of complaints and adjustments to reduce to a minimum the shunting about of customers and to permit uniform administration of regulations; and (4) public relations propaganda to improve and maintain good customer relations.

A sound system for plant operation has been developed in the Detroit municipal water utility as follows: (1) Plant-wide functional responsibility for water purification; (2) constant maintenance of structures, plus 24-hr. crews always ready for emergency fire and repair service; (3) constant leak inspection work, using accurate methods of measurement in valved districts; and (4) use of proper materials and construction methods.

The municipal water utility need not be unprogressive. Community pride will support improvements in the operating system at a rate comparing favorably with private practice. The Los Angeles municipal water utility has proved over a 20-yr. period that progress in operatng practice can go on at a rapid and efficient pace under public-ownership conditions. Los Angeles has pioneered many technical and operating improvements. It is high time to reverse our point of view. Let the municipal water utility manager keep his operating systems ahead of private practice and at the highest efficiency level as a matter of professional pride. It can be done.

Furthering improvements

Improvement in organization and management of water utilities depends on recognition of the proper relationship between the public's representatives and salaried executives, development of public support for progressive management, and evolution of a salaried executive group that is free from the influence of political pressure.

The public's representatives such as the mayor, city council or water board cannot manage the water utility satisfactorily. Their tenure of office is uncertain and they cannot have a career point of view. They are often unpaid and cannot take sufficient time away from their regular work for such a task. Furthermore, they are rarely selected for their ability as executives.

When the public's representatives do try to manage, in a detailed supervisory sense, they usually become dictators. This is the role so often assumed by well-intentioned mayors. They dominate the city council and appoint subservient board members and water utility executives who are political cronies. Then the mayor tries to be personally responsible for such details as doling out jobs, giving construction favors, and exercising leniency in collections or adjustments. Under such a regime no employee, including the appointed salaried executive of the water utility, can call his soul his own. Every move, every minor decision is made either at the command of the mayor or else is made with fear as to the attitude of the mayor. Such dictatorship is ineffective management because it destroys morale and shifts the emphasis from efficient economy to political expediency. Mayor-made policies in such controlled circumstances lack the healthy check upon personal whim or prejudice which is provided by an independent committee such as the city council or water board.

Improvement in organization and management of water utilities depends on recognition of the proper relationship between the public's representatives and salaried executives, development of public support for progressive management, and evolution of a salaried executive group that is free from the influence of political pressure.

The sensible role for the public's representatives to play is that of trusteeship, using the term in a broad sense to mean responsibility for major policies, legal custodianship of the public's property and representation of the consumer in management councils. Trusteeship is a worthy, responsible and dignified task in the water utility. The public trustee is the thoughtful member of the board of directors. He is the chairman of the board. He is never the salaried operating executive.

It is natural to obscure this question of management behind persons and notions. One such notion is that salaried management is not worthy of its hire. It is easy for the politician to run for office on the simple platform of saving a few conspicuous salaries by doing all the work of management himself.

Another notion is that a publicly owned business is easier to manage than the same business under private control. Actually the reverse is true if we desire efficient economical management. The private business is closely knit together at the top, owners and major executives being closely coordinated. In a public business management is performed by a composite group of citizen-voters, elected officials and appointed salaried executives. Efficient management under such conditions is not achieved by dictatorship of one official over all others, but by painstaking coordination. So far as coordination is concerned public management is more complex and requires more skill than does private management.

A false notion

An unfortunate notion is that public management can be simplified and therefore cheapened by separation of the task into well-defined parts, each assigned to a different functional executive. Thus in extreme form, all buying is assigned to the commissioner of supplies, who is an amateur executive elected to the commission or city council. This type of legal over-functionalization is a prime source of waste, red tape and political intrigue. It leads to dictatorial red-tape cutting, to useless bickering and duplication of records and to public inconvenience. Functionalization is a sound principle of organization in its proper place but over-functionalization creates a management of independent prima donnas each fighting to survive by domination.

In few cities is there apparent strong public support for efficient water utility management but everywhere the basic underlying public opinion favors good and progressive management. The public relations problem is to develop and make vocal this underlying attitude of support. The best antidote for unreasoning attack or political intrigue is information. The truth never hurts when it is disclosed honestly and with a view to obtaining public advice and counsel.

An attitude exists among water utility executives that the field of public relations is not a proper part of the work of a salaried executive. It is thought that public relations is a phase of political control and belongs to the public's representatives. This point of view is built on the idea of separate functional duties, rather than of coordination. If the public's representatives and the salaried executives are coordinated both will have a part in public relations. The water board, or mayor and council, will have their contact with the public on major policy matters. The salaried executives will win public confidence through frank revelation and discussion of operating problems and plans. Public relations is a two-way matter. The water utility executive who strives for public favor and support must merit such approval. Thus both sides influence each other and salaried management becomes worthy of its hire.

To be worthy of his hire, the executive of the publicly-owned water utility cannot be the trained seal of the party or faction in power. Most water utility executives are well-educated and experienced engineers. There is no doubt in their minds as to their ethical responsibility on technical matters of plant safety. But on questions of efficiency *vs.* political expediency they are too likely to seek compromise.

School superintendents in this country have won at least partial immunity from political pressure by brave and open fighting for the right policy toward school children. Superintendents have been powerfully supported in working toward this ethical ideal by militant associations which have used strong measures, even akin to blacklisting the backsliding school district.

It is high time for water utility executives to become conscious of their ethical responsibility for the public welfare. Is it too idealistic to urge that associations of water utility executives be militant in support of better municipal organization and of courageous water utility men who sacrifice their jobs to their ideals of public welfare?

Notes on Sewage Disposal

A monthly summary of current developments

conducted by Willem Rudolfs

MEAT WASTE DIGESTION—Anaerobic digestion of packing-house wastes under high and low temperature conditions is of interest at places where such wastes are received together with domestic sewage. Levine, Nelson and Dye (Iowa Eng. Exp. Sta. *Bull.* 130, 1937) report semi-plant scale experiments conducted with packing house waste added to previously digested sludge indicating that such waste digests readily at a temperature of 80 to 86 deg. F. Gas production amounted to 12.3 cu.ft. per lb. of fresh volatile solids added with about 90 per cent obtained in 25 days. Observations indicated that the waste would probably require a shorter digestion period than sewage sludge.

Packing house waste digested more rapidly at 120 to 130 deg. F., but the high temperature process was not considered feasible because of the extremely ill-smelling effluent and the apparently poor settling qualities of the digested sludge. In this connection, a short period of high temperature digestion followed by a short period of low temperature digestion might be found useful. Some years ago (*Ind. Eng. Chem.* 22, 96, 1930) attention was drawn to the fact that seeding with ordinary ripe sludge produced an initial period of inactivity due to time required for the establishment of the proper thermophilic flora. It is of interest to note that packing house waste behaved similarly, indicating further that such organic waste follows established principles of sewage sludge digestion.

FISH POND TREATMENT—Various methods of treating sewage to an intermediary degree have come to the front during the last few years. Most of these are modifications of existing methods or improvement of mechanical devices. Not to be overlooked are fish ponds which are capable of purifying sewage to a degree comparable to the best artificial methods available. Results on the well-known Munich fish ponds, where screens and sedimentation units are followed by 30 ponds about 3 ft. deep, with an area of nearly 17 acres, are described by Kisskalt and Ilzhöfer (*Archiv. für Hygiene und Bakteriologie,* 118, 1937). About 8 m.g.d. of sewage, diluted with water in the ratio of 1:4, are treated in these ponds. Chemical and bacteriological tests show no putrescibility in the effluent, an increase in oxygen content, and considerable reduction in B.O.D., ammonia, turbidity and bacterial population. The greatest purification takes place in summer when it is most needed. The degree of treatment can be varied with the number of fish ponds used by the disposal system.

AERATION WITH ASBESTOS—In a previous note (ENR Jan. 21, 1937, p. 102) reference was made to the Swiss "Z-method" of treatment in which asbestos filters are added to sewage undergoing aeration. Visitors to the plant made the statement that similar results could probably be obtained with aeration in the absence of asbestos. Wieser (*Gesundheits Ingenieur* April 4, 1937) states that investigations by the St. Gallen (Switzerland) laboratory have shown that addition of finely divided asbestos fibers effectively aids absorption, reduces the oxygen demand of the sewage, and allows adherence of biological organisms to the extent that 340 per cent organic material can be handled (on basis of asbestos weight). A clear effluent with low B.O.D. is produced; the formation of nitrates indicates that definite stabilization takes place with only one hour aeration. Of particular interest is that good floc formation is said to occur almost immediately instead of the several weeks operation usually required with activated sludge. If all claims are substantiated the use of asbestos fibers should be a boon to activated sludge plants where insufficient aeration is available or floc fails to settle properly.

THE WEEK'S EVENTS

Continued from page 293

Pan American Road Meet Called for Next Year

A Pan American highway conference to take place in Santiago, Chile, September 1-15, 1938, has been called by the Chilean organizing commission. The purpose of the congress is given as the coordination of effort among the members of the Pan American Union to advance and develop highway construction. Members of the congress will be official representatives of the respective governments.

Among the principal subjects to be covered at the conference are soil studies and the adoption of standards for classification of soils, construction methods for pavement foundations, low-cost roads, high-speed highways, highway laboratory developments, bridges, and studies of highway traffic. Legislation for the administration and financing of highway systems, and international highway agreements will also be studied.

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Lectures on New N. Y. Code At Federation School

A series of lectures on New York's new building code will be begun during the week of September 20 by the Federation Technical School of the Federation of Architects, Engineers, Chemists and Technicians, 114 E. 16th St., New York City.

George McCaffrey, secretary of the Merchants Association of New York, will open the series with a general talk on the significance of the code for architects and builders. Others who are concerned in the drawing up of the code will discuss its various technical provisions.

If sufficient interest is shown, the course will be repeated.

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Rubber Pavement Works Moscow Reports

A rubber pavement which was laid as an experiment in Moscow, USSR, about 9 months ago has been reported meeting the tests to which it has been subjected, according to the U. S. Department of Commerce. The pavement was laid on an approach to a large Moscow factory and has been subjected to traffic of heavy trucks, wagons, and track laying tractors.

It is stated that the pavement is noiseless and that neither snow nor ice will adhere to it for a long period during the winter season. Another advantage claimed is that it can be easily washed. It is reported in Moscow that the local city council is considering laying rubber pavements in one of the larger sections of the city, according to the department.

ROY B. WILLIAMS whose appointment to the position of assistant commissioner of the Bureau of Reclamation was recently announced in these pages.

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Montana Bituminous Meeting

The third annual Montana Bituminous Conference will be held Sept. 7, 8 and 9 at the Many Glacier Hotel in Glacier National Park. All of the states, the provinces in Canada, several departments in Mexico, leading industries and interested colleges and universities have been asked to prepare papers outlining developments or trends in bituminous practice in the regions or industries from which their delegates come.

Illinois Town Moved To High Ground

Shawneetown, Ill., located at the confluence of the Ohio and Wabash Rivers and twice ravaged by floods in the last quarter century has started to move to higher ground. Three miles from the original town site, the new Shawneetown with its 1,400 inhabitants will be completely established in about two years, it is estimated. The new community will require no flood protection, being 50 or more feet above the high-water mark which was reached by the 1937 flood.

The site of the old, flood-ravaged Shawneetown will be preserved by the state of Illinois for a park. Landowners will receive deeds to plots in the new townsite, which was purchased by the state from a $150,000 fund appropriated by the last session of the legislature.

About half of the existing residences —177 to be exact—will be moved intact to the new site. From the rest, many badly damaged by flood waters, much material will be salvaged by the owners. Public, commercial and industrial structures will, for the most part, be built new. Assisting the state in the project will be the federal government through the agencies of the RFC, the HOLC, the FHA, and the Disaster Loan Corporation. In addition, rehabilitation grants made by the Red Cross will aid in establishing the homeless in modern, new residences.

In design, the new Shawneetown is unusual. The general plan of the town is oval, with no part more than three blocks from the center. Main Street will be paved 100 ft. wide. Bordering it will be 5 ft. sidewalks with 30 ft. parkways between the walks and the streets. Behind the stores will be parking areas for patrons. Auto service stations will have no place on Main Street but will also be located at the rear of the store buildings. A new Gallatin County courthouse will be erected in a circular plot at one end of Main Street, with the community center at the other. A new sewer system has been planned to meet future requirements and an extension of the PWA-built waterworks system, completed less than two years ago, will serve the new community.

Design for the new Shawneetown is the work of Mary Long Whitmore of Metropolis, Ill. She is a landscape architect who formerly practiced at Larchmont, N. Y. Her plan was accepted in a competition conducted by the Gallatin County Housing Authority and her model of the new town is on display at the headquarters of the authority.

CALENDAR OF MEETINGS

NATIONAL SOCIETIES

Canadian Good Roads Association, annual convention, St. Andrews-by-the-Sea, N. B., Sept. 7-9.

American Association of State Highway Officials, annual convention, Boston, Sept. 27-30.

American Public Works Association, annual conference, Atlanta, October 4-6.

American Public Health Association, annual meeting, New York, Oct. 5-8.

National Council of State Boards of Engineering Examiners, annual meeting, Scranton, Pa., Oct. 11-13.

National Safety Congress, Kansas City, Oct. 11-15.

American Welding Society, annual meeting and exposition, Atlantic City, N. J., Oct. 18-22.

Canadian Institute of Sewage and Sanitation, annual convention, London, Ont., Oct. 21-22.

American Institute of Steel Construction, annual convention, White Sulphur Springs, W. Va., Oct. 27-29.

REGIONAL AND LOCAL

Section Meetings, American Water Works Association: North Carolina, Wilmington, August 26-28; New York, Schenectady, Sept. 30-Oct. 1; Rocky Mountain, Santa Fe, N. M., Sept. 20-22; Southwest, Austin, Tex., Oct. 18-21; California, Sacramento, Oct. 20-23; Minnesota, St. Paul, Oct. 28-30.

Pennsylvania Society of Professional Engineers, annual convention, Hershey, Pa., Aug. 21.

Montana Bituminous Conference, annual conference, Glacier National Park, Sept. 7-9.

New England Water Works Association, annual convention, Poland Spring, Me., September 21-24.

Rocky Mountain Sewage Works Association, first annual meeting, Santa Fe, N. M., Sept 20-23.

OFFICERS ELECTED

The Southern Vitrified Pipe Association elected the following officers at an annual meeting in Atlanta on Aug. 3: President, C. B. Beasley; Vice-President, W. C. Boren, Jr.; Secretary, John M. Byrne; Manager, D. M. Strickland. Plans of the association call for enlargement of promotional work and include advertising designed to reach city officials and engineers.

At Its Weekly Meetings in July, the Sacramento Section of the A.S.C.E. inaugurated the plan of having a junior member give a short talk at each meeting on some subject in which he is interested. At one meeting, Max Bookman, junior member, spoke on "Field Methods of the Highway planning Survey," and at another meeting Glenn L. Enke, junior member, discussed the design and construction of grade separation crossings in California. Alexander Russel, at the last meeting of the month, spoke on the sewer systems of Sacramento.

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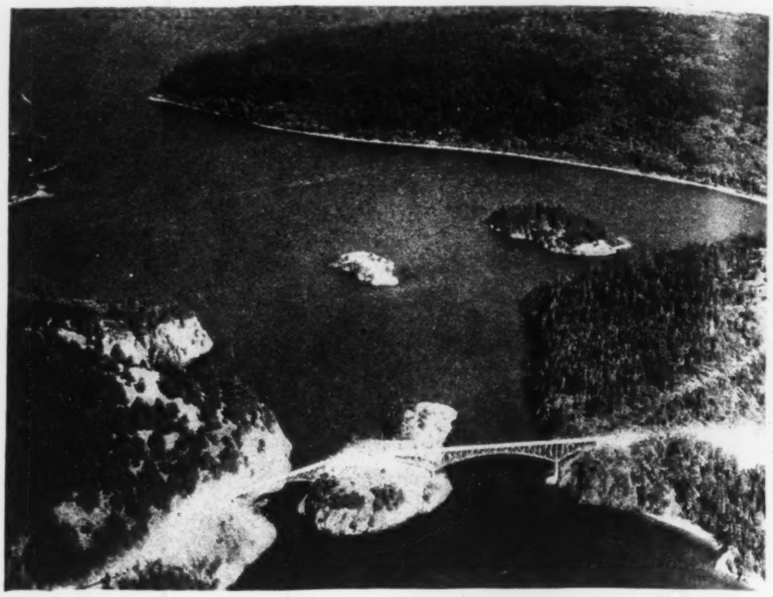

FERRY BOATS ELIMINATED

New 1,720-ft. bridge across the Deception Pass and Canoe Pass, Puget Sound, Wash., eliminates ferry service to Whidby Island, a popular summer resort, and points west. Moreover, Port Townsend, one of the largest cities on the Sound, is more easily accessible with the completion of the bridge. The structure was built with a grant of $92,000 from the PWA.

New York Engineers' Salaries Rise

Median salaries of engineers in 32 New York cities and 27 New York counties are returning to their 1930 level, according to a report to the New York State Association of Municipal Engineers by Arthur Richards June 30. The results of Mr. Richards' survey are tabulated below.

MEDIAN SALARIES OF ENGINEERS

Position	Cities		Counties	
	1930	1935	1930	1935
Chief Engineer	3900	3470	4750	4680
Engineer	3840	3440	3450	3050
Asst. Engineer	2685	2590	2750	2610
Junior Asst. Engineer	2185	2150	1950	1990
Junior Engineer	1500	1430	1660	1645

The New York State Association of Municipal Engineers was formed eleven years ago and is affiliated with the State Conference of Mayors.

Flow of Silty Waters To Be Studied

Sub-committees of the National Research Council have been set up to study density currents in Lake Mead and in the Elephant Butte reservoir. A program of field observations on the flow of silty waters through these reservoirs is being formulated. At the same time efforts will be made to reproduce conditions on a small scale at the National Hydraulic Laboratory under which silt-laden currents of different densities maintain their identities and do not merge.

The field work involves the establishment of a number of observation stations on Lake Mead and on the Elephant Butte reservoir, to record stratification conditions, turbidity temperatures and light penetration. Samples will be taken to determine the specific gravity of the water, its content of carbon compounds and the amount of dissolved oxygen.

The work will be done under the general direction of Herbert N. Eaton, Chairman of the National Research Council Interdivisional Committee on Density Currents. C. P. Vetter, of the Bureau of Reclamation, is chairman of the subcommittee that will study the Lake Mead project while C. S. Scofield of the Bureau of Plant Industry will be chairman of the Elephant Butte subcommittee.

PERSONAL

Hoyt C. Brown has been appointed division engineer of the fourth division of the Georgia Highway Department.

Capt. Archibald L. Parsons, of the Navy Civil Engineer Corps, now serving as public works officer at the Brooklyn Navy Yard, has been promoted to the rank of Rear-Admiral.

Charles A. Brown, for the past several years a sewer engineer in the engineering department of the city of Indianapolis, has resigned that position. No successor has been selected.

Lt. Col. Frank S. Besson, U. S. Engineers, who has been in the office of the chief engineer in Washington, has been made district engineer of the Galveston district.

Lt. Col. Edwin H. Marks, who has been district engineer for the past four years for the Galveston district of the U. S. Engineers, has been transferred to the Buffalo engineer district.

William J. Shedwick, Jr., and **B. Harold Wills** have opened an office in Camden, N. J. to practice civil, mining and municipal engineering and land surveying under the firm name of Shedwick & Wills.

John A. Baird, former city engineer of Sarnia, Ont., has been appointed resident engineer for the Ontario Department of Highways on the construction of the approach to the St. Clair River bridge.

H. P. Pickering, formerly in the engineering department of the Santa Fe R. R. and since connected with the U. S. Bureau of Public Roads, has joined the Toncan Culvert Manufacturers Association as a sales engineer.

William Whitehead has been appointed resident engineer for the Ohio state highway department in Lawrence County. Mr. Whitehead was formerly a construction engineer in the federal service stationed at Chillicothe.

Lt. Col. J. D. Arthur, who has been district engineer at Zanesville, in charge of the Muskingum River flood control project, has been appointed district engineer at Huntington, W. Va.

Lt. Col. John F. Conklin, district engineer, Huntington, W. Va., has been transferred to the Panama Canal Zone.

W. M. Hall, who was a construction engineer for the TVA at Wheeler Dam, is now in charge of design and construction of hydroelectric projects for the Puerto Rico Reconstruction Administration with headquarters at Ponce.

James R. Pollock, director of public works and utilities for the city of Flint, Mich., has been appointed city manager of that city.

Selwyn P. Bryant, formerly general construction manager for Thomas Kelly & Son of Anderson, Ind., is now superintendent and estimator for Charles W. Angle, Inc., building contractors of Greensboro, N. C.

Richard G. Tyler, professor of sanitary engineering at the University of Washington and head of the department of civil engineering, has been relieved of his administrative duties as head of the department to have more time to devote to a text he is preparing.

R. B. Van Horn, associate professor of civil engineering at the University of Washington, has been appointed head of the department of civil engineering.

Stanley I. Pinel, principal engineer in the department of research and service of Louisville, Ky. has joined the headquarters staff of the American Public Works Association to conduct the research program which the association is undertaking in the field of public works administration.

Carl Wentz, who was recently connected with the WPA and was formerly with the Ohio state highway department, has been appointed assistant city engineer of Ironton, Ohio, to fill the vacancy created by the recent resignation of Fred Hardy. Mr. Wentz is a graduate of the University of Cincinnati.

Tom G. Banks, recently opened an office in Oklahoma City to practice as a civil engineer and advisor to municipalities in water works and sewage matters. Mr. Banks recently resigned his position as superintendent and engineer of the Oklahoma City water department, which position he had held for 17 years.

George R. Thompson has been appointed city engineer of Detroit to succeed the late Joseph F. Stringham. The appointment was made after a civil service examination. Mr. Thompson, who for the past eight years has been Michigan state budget director, was formerly employed by the city of Detroit as chief building inspector for the department of buildings and safety engineering and later was in charge of the division of municipal waste of the department of public works.

OBITUARY

Frank H. Smith, president since 1922 of the Lawrence Portland Cement Co., died Aug. 10 in Plainsfield, N. J., at the age of 68.

Leonard H. Anthony, for fifteen years superintendent of public buildings at Hartford, Conn., died there July 22 at the age of 66.

John P. Carmody, assistant secretary of the New York City Tunnel Authority, and formerly an employee of New York construction companies, died in North Pelham, N. Y., Aug. 7, at the age of 45.

William F. O'Neil, general contractor of Hartford, Conn., died July 25, at the age of 82. Mr. O'Neill had been a member of the Hartford Building Commission and was a former president of the Board of Street Commissioners.

Gilbert Young, 64, connected for 35 years with the U. S. Geological Survey, was killed Aug. 8 in an automobile accident near Rome, N. Y. Mr. Young was a graduate of Rensselaer Polytechnic Institute and first joined the Geological Survey in 1902. He was connected with the topographic branch of the survey.

Clifford A. Owens, president of The Osgood Co., died in Marion, Ohio, July 28. In addition to his presidency of the Osgood Co., Mr. Owens held the presidency of the General Excavator Co., the Commercial Steel Casting Co., the Alloy Cast Steel Co., the Hercules Co., the Power Manufacturing Co., and the Engineering Equipment Co., all of Marion.

Thomas F. Mahar, president of the Chapman Valve Mfg. Co. of Indian Orchard, Mass. since 1931, died in Providence, July 29, at the age of 62. Mr. Mahar entered the Chapman organization in 1909 and was an outstanding figure in the development of valves to meet high temperature and high pressure requirements in utility and industrial service.

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Hartford Creates Traffic Bureau

The creation of a street traffic bureau is needed by the city of New Haven, according to a recent report made by the New Haven traffic commission. The commission reports that 20 per cent of the motor traffic through congested business streets is caused by traffic led there by inadequate signs.

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

SEWERS, ST. LOUIS, MO.

OWNER: St. Louis Board of Public Service; L. A. Pettus, City Engineer.

PROJECT: Construction of 2,000 ft. of 12 to 54-in. vitrified tile sewer in open cut and 1,450 ft. of 54-in. sewer in tunnel, with paving and street repairs, comprising Section 3E, Southern-Arsenal Public Relief Sewers, in south central St. Louis.

BIDS: Eight bids ranging from the contract low of $65.236 to a high of $105.285, were opened June, 1937, with completion scheduled for 23 weeks after contract award, minimum hourly wages stipulated of $1.50 for skilled and 70c for common labor. All materials required for the construction to be furnished by the contractor.

LOW BIDDERS:

1. Walsh & Wells, Inc., St. Louis, Mo. (contract)	$65.236
2. Samuel Kraus Co., St. Louis, Mo.	67.812
3. Stiers Bros. Const. Co., St. Louis, Mo.	72.523

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, Cl. A	420c. y.	$10.00	$6.00	$6.00
2. Excavation, Cl. B	400 c. y.	2.30	2.00	2.60
3. Excavation, Cl. C	2,400 c. y.	1.15	1.00	1.40
4. Granular fill	2,000 c. y.	1.00	1.50	.80
5. Brick, m.h., inlet	1,680 c. f.	1.00	1.10	1.00
6. Concrete, Cl. A	50 c. f.	.50	.50	.80
7. Concrete, Cl. B	100 c. f.	.40	.46	.60
8. Concrete, Cl. C	100 c. f.	.35	.45	.40
9. Vit. tile sewer, complete, 12 in	200 l. f.	.80	1.10	.80
10. Vit. tile sewer complete, 15 in	120 l. f.	1.25	1.30	1.25
11. Vit. tile sewer complete, 18 in	460 l. f.	1.75	1.75	1.70
12. Vit. tile sewer, complete, 21 in	200 l. f.	2.20	2.25	2.15
13. Vit. tile sewer complete, 27 in	490 l. f.	3.25	3.50	3.30
14. Vit. tile sewer complete, 33 in	330 l. f.	4.00	6.00	4.50
15. Vit. tile sewer complete, 36 in	115 l. f.	5.00	6.25	4.75
16. Vit. tile sewer complete, 54 in	260 l. f.	8.00	8.75	7.75
17. Transition, 2½ x 3½ ft	7 l. f.	6.00	15.00	25.00
18. Junc. Y. 12 in. pipe	12 each	2.50	5.00	5.00
19. Junc. Y, 15 in. pipe	1 each	4.00	10.00	7.50
20. Junc. Y, 18 in. pipe	1 each	5.00	12.50	10.00
21. Rebuild old inlets	5 each	20.00	10.00	50.00
22. Inlet pipe conn	19 each	10.00	10.00	10.00
23. Unit stones, sills, etc	2 set	10.00	10.00	10.00
24. Cast iron	10,340 lb.	.05	.05	.05
25. Steel spec. inlets	1,010 lb.	.05	.10	.10
26. Trench lumber	25 M.b.m.	30.00	30.00	30.00
27. Remove curb for new inlets	2 each	5.00	5.00	10.00
28. Remove bit. pavem't	300 s. y.	.50	.75	.50
29. Remove brick surf	23 s. y.	1.00	.75	.50
30. Remove conc. base, pavements	325 s. y.	1.00	1.00	1.00
31. Remove conc. gutter	60 s. f.	.10	.30	.25
32. Conc. pave. base	600 s. y.	2.00	2.25	2.00
33. Asph. surf., binder course.	295 s. y.	3.00	3.00	3.00
34. Brick surf., bed course	16 s. y.	2.50	3.00	3.00
35. Conc. gutter	60 s. f.	.25	.50	.50
36. One course asph. conc. surf.	280 s. y.	1.00	3.00	1.00
37. Remove conc. sidewalks	180 s. f.	.05	.10	.10
38. Restore conc. sidewalks	180 s. f.	.25	.30	.40
39. Cure concrete	350 s. y.	.05	.05	10
40. Junct. chamber, complete.	1 l. s.	500.00	400.00	500.00
TUNNEL				
41. Completed sewer, 54 in	1,455 l. f.	27.63	28.56	33.00
42. Excav. Cl. A	150 c. y.	6.00	6.00	6.00
43. Excav. Cl. B	300 c. y.	1.00	1.00	1.00

WANAKENA DAM, NEW YORK

OWNER: Dept. Public Works, Albany, N. Y.; T. F. Farrell, Chief Engineer.

PROJECT: Repairs to dam for ater supply for College of Forestry, Wanakena, St. Lawrence Co., N. Y.

BIDS: Five bids were opened June 8, 1937, ranging from the contract low of $3,350 to a high of $4,490 with minimum hourly wage rates stipulated of $1.00 for skilled and 45c. for common labor.

CONDITIONS: State findings indicate no puddle material within 30 miles of the project, necessitating a truck haul. If suitable, a closer source will be permitted.

LOW BIDDERS:

1. George G. Coopy, Plattsburgh, N. Y. (contract)	$3,350
2. Arnold M. Diamond, Brooklyn, N. Y.	3,440
3. Fred Ballard Const. Co., Syracuse, N. Y.	3,445

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Remove humus	L.S.	$500.00	$400.00	$800.00
2. Puddle	650 c.y.	4.00	4.00	3.70
3. Maintain water flow	L.S.	250.00	440.00	500.00

CONNECTICUT HIGHWAY BRIDGES

OWNER: Connecticut State Highway Dept.; J. A. MacDonald, Engineer.

PROJECT: Construction of eight steel and reinforced concrete bridges with approaches: (I) 20-ft reinf. concrete slab bridge over Bigelow Creek, with 200 ft. loose gravel approach on Matwyko Rd. in Eastford; (II) reinforced conc. triple arch bridge over Norwalk River in Norwalk; (III) 62-ft. skew span stonefaced conc. rigid frame bridge over Main Ave. in Norwalk; (IV) 46-ft. I-beam bridge over Mashamoquet Brook in Pomfret; (V) 26-ft. skew span I-beam bridge over Bigelow Creek with approaches on Floeting Rd. in Eastford; (VI) 60-ft. skew span steel deck girder, reinf. concrete slab bridge over Quinebaug River with approaches on Fabian Rd. in Thompson; (VII) 59-ft. skew span rolled girder bridge over French River with approaches on Porter Plains Rd. in Thompson; (VIII) overpass and approaches, 2,525 ft. long, over Central Vermont R.R. in Norwich.

BIDS: Opened June, 1937, with the three low bidders for each project summarized below. Minimum hourly wage scales are stipulated of 75c. for skilled and 50c. for common labor, with completion scheduled as indicated.

LOW BIDDERS:

(I) Bigelow Brook Bridge—60 days.	
1. Brunalli Const. Co.	$4.198
2. Fred D. Miller	4.485
3. N. Benvenuti & Sons	5.403
(II) Norwalk River Bridge—120 days.	
1. Mariani Const. Co.	$114.358
2. A. I. Savin	118.849
3. N. Benvenuti & Son	131.781
(III) Main Ave. Bridge, Norwalk—120 days.	
1. C. W. Blakeslee & Sons Inc.	$70.259
2. Paul Bacco	74.306
3. Frank T. Westcott	75.801
(IV) Mashamoquet Brook Bridge—90 days.	
1. L. E. McLaughlin Inc.	$7.267
2. Fred D. Miller	7.680
3. Medbury & Trowbridge	7.889
(V) Bigelow Brook Bridge, Floeting Rd.—120 days.	
1. Brunalli Const. Co.	$8.394
2. Fred D. Miller	9.367
3. N. Benvenuti & Sons	9.733

(Contract Unit Prices continued on second following page)